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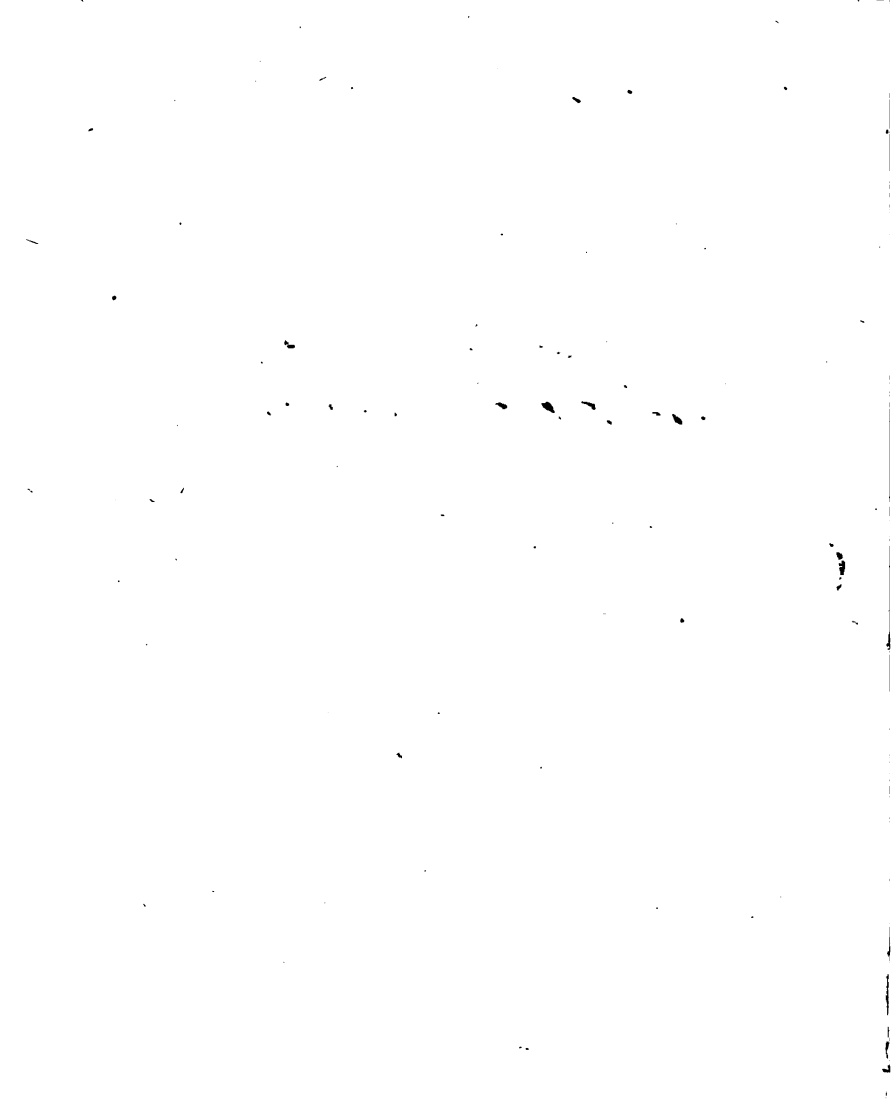
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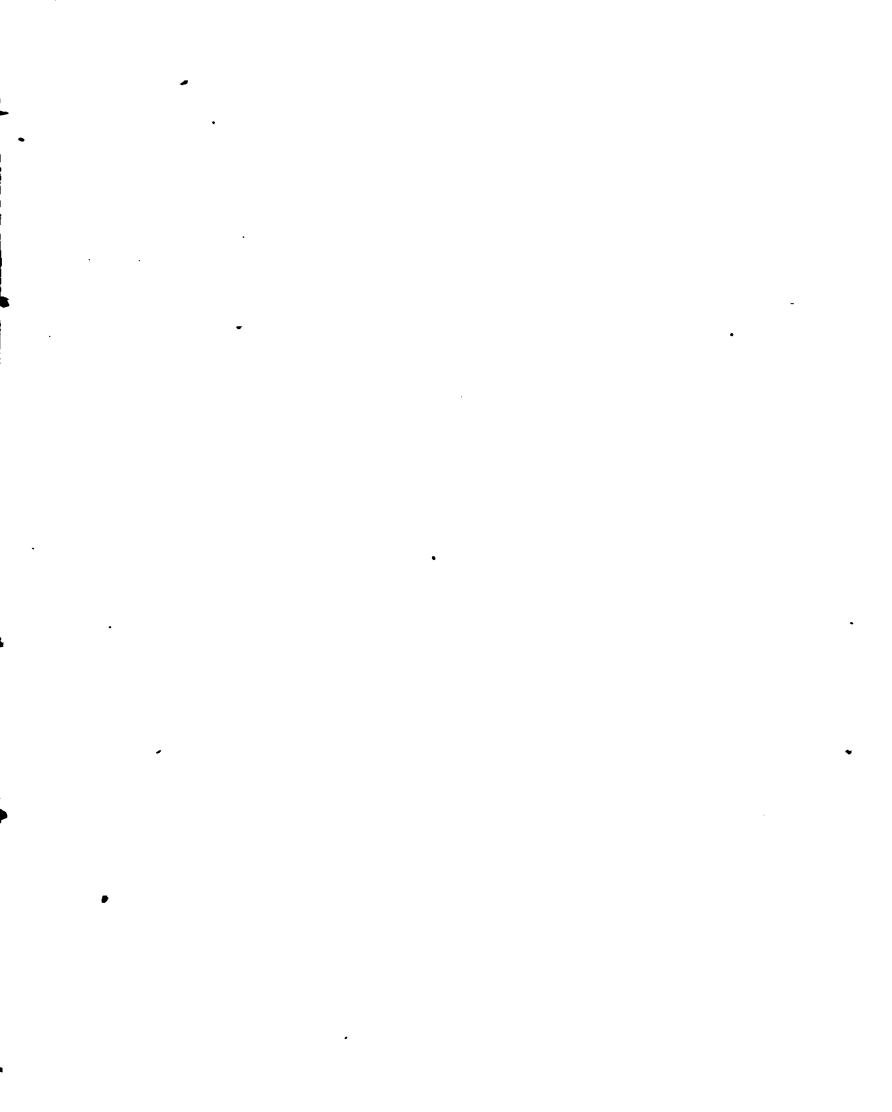


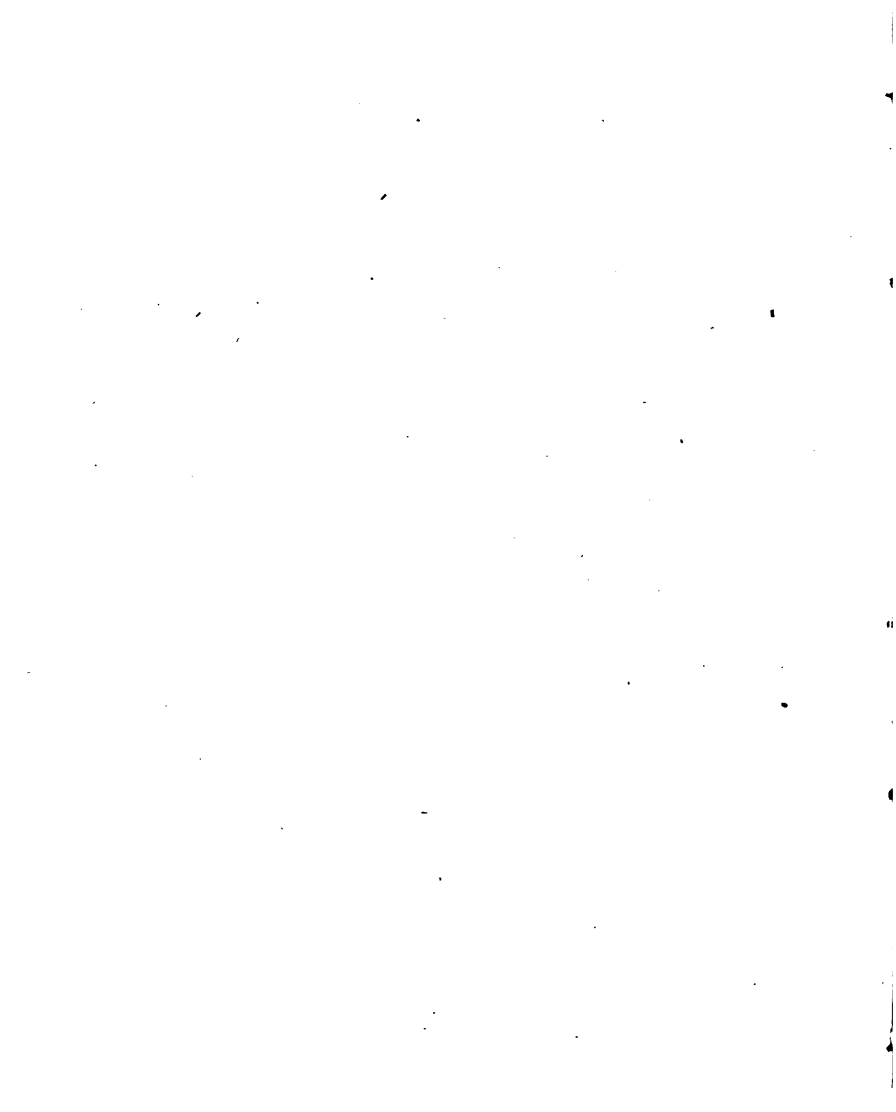
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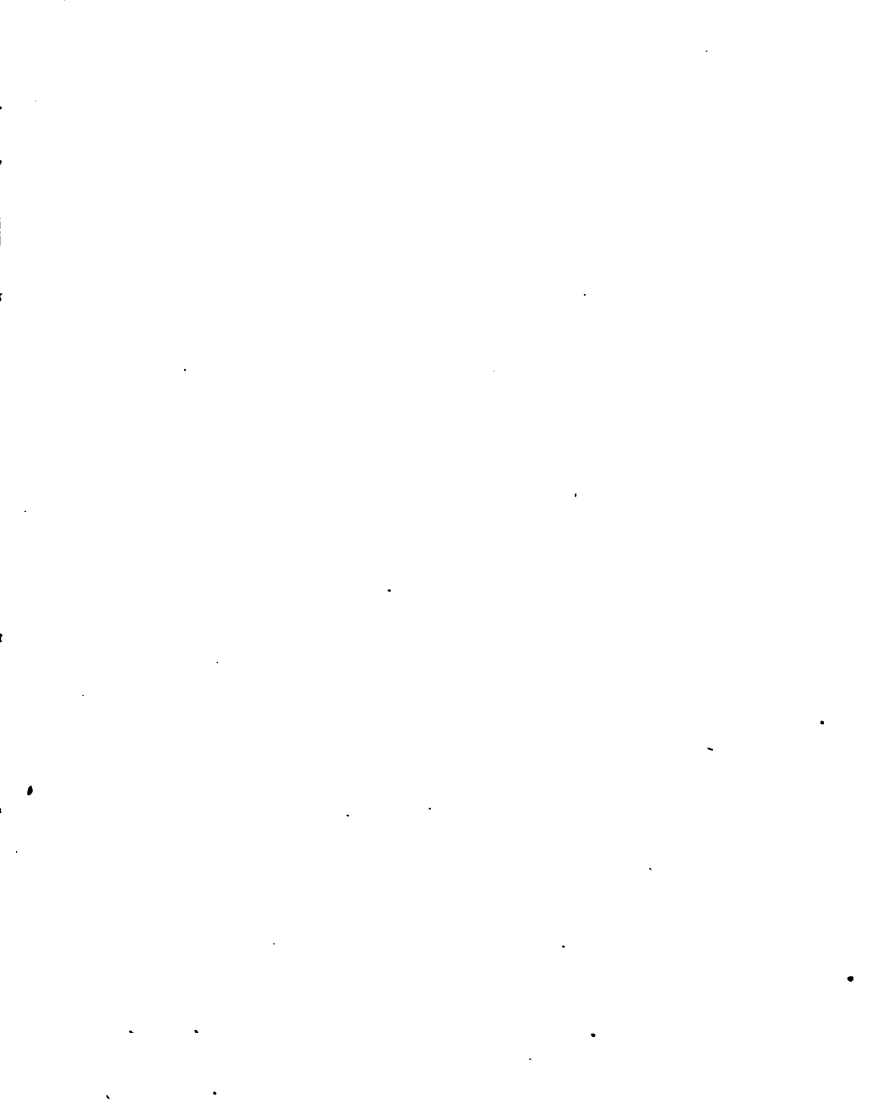
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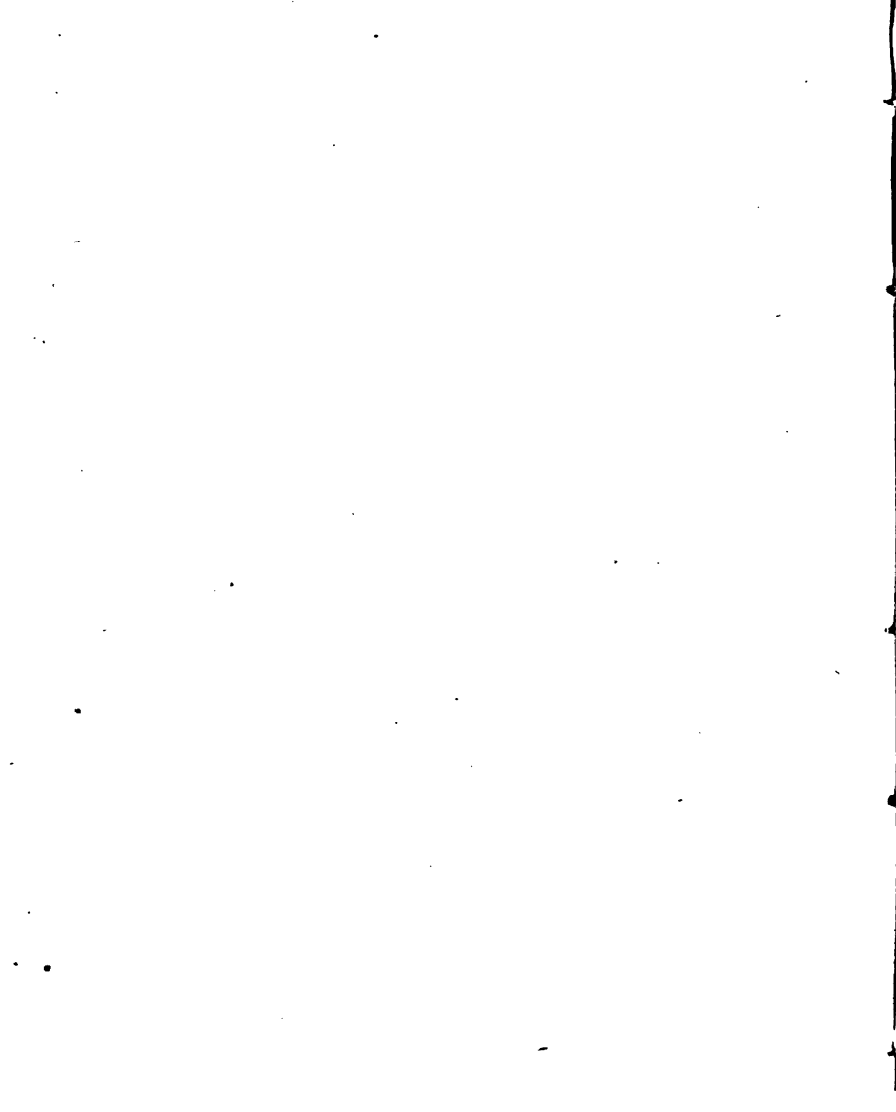
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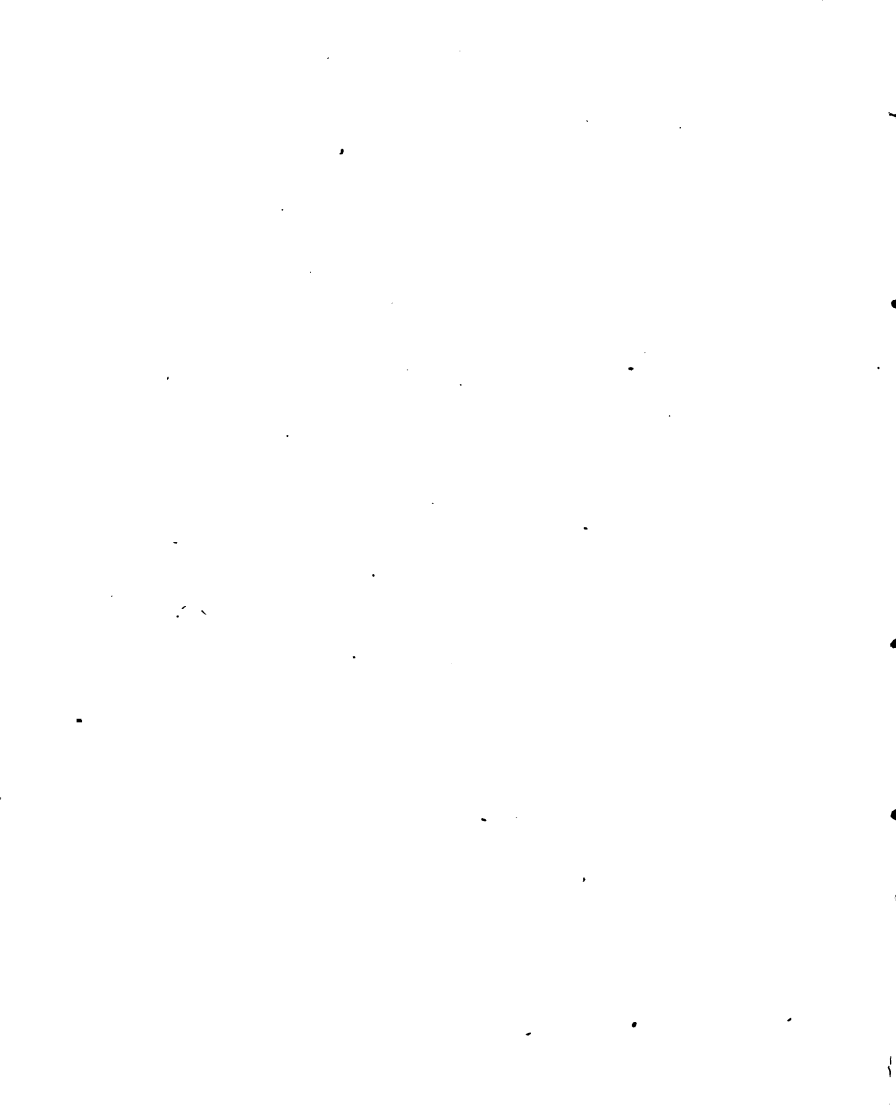


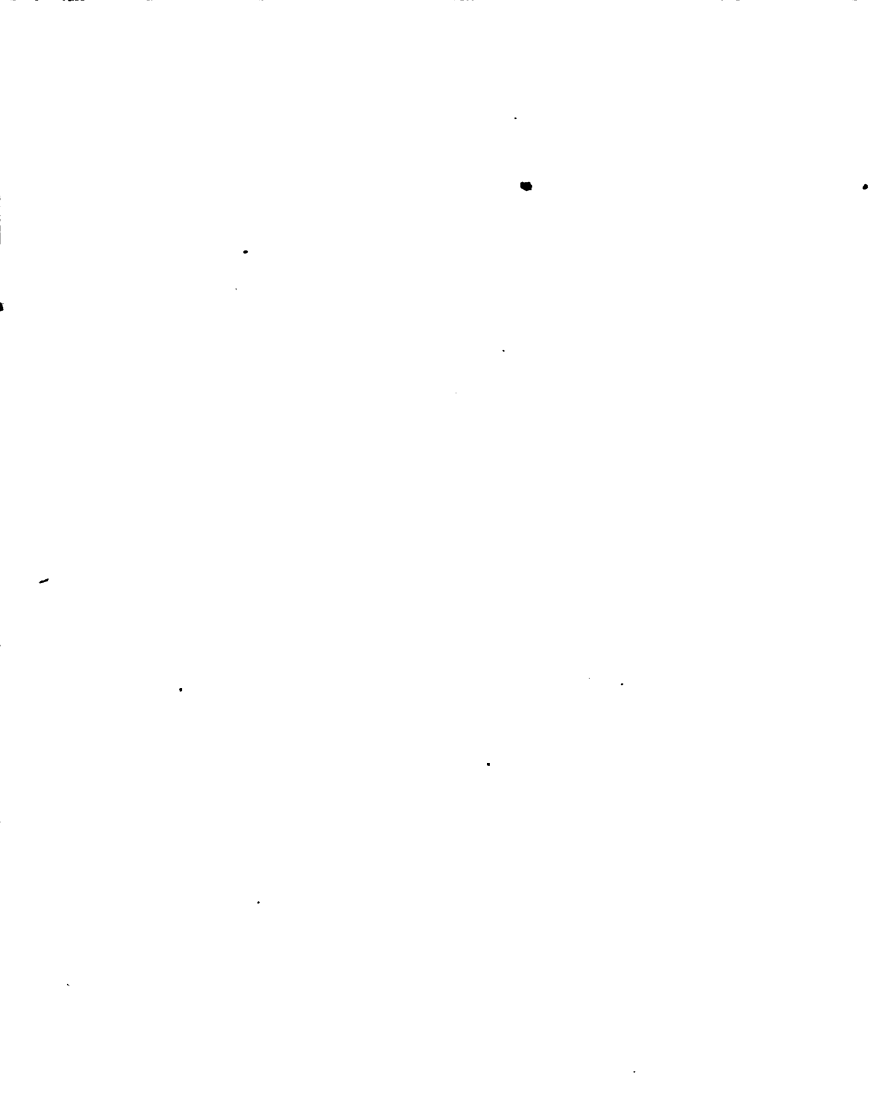


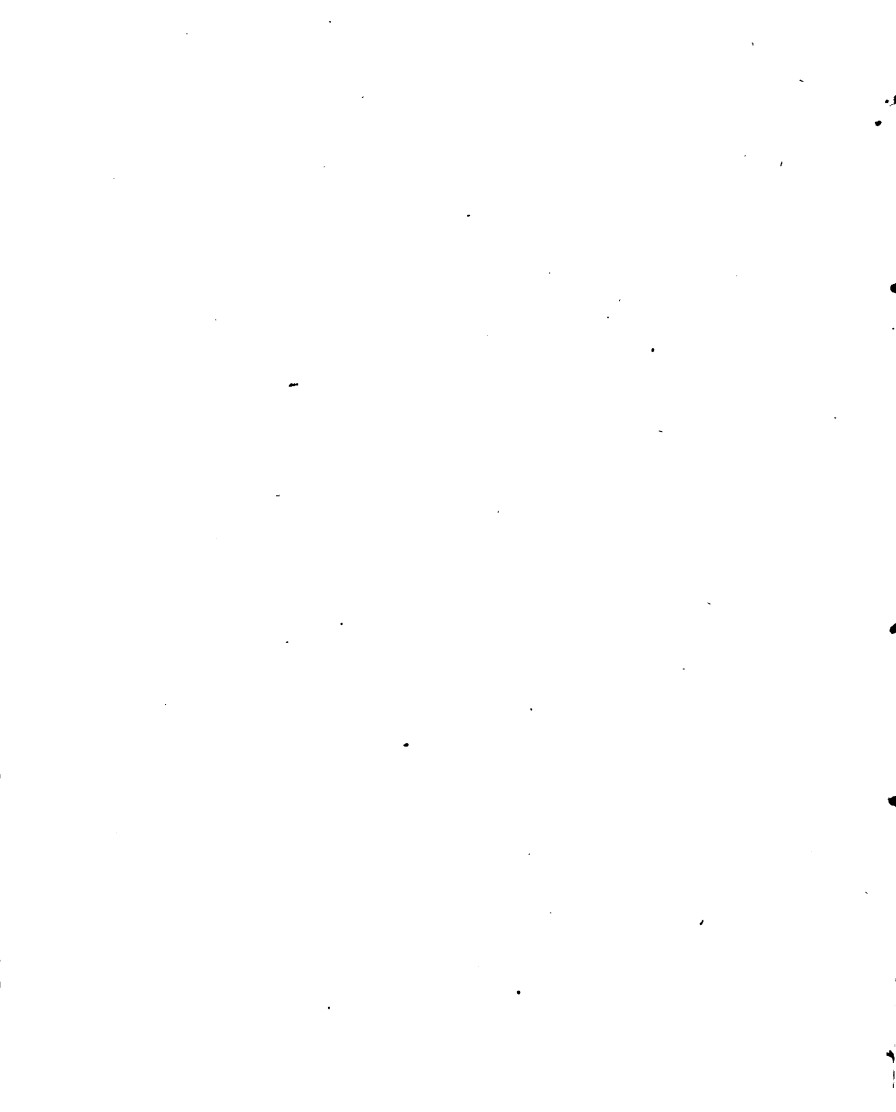


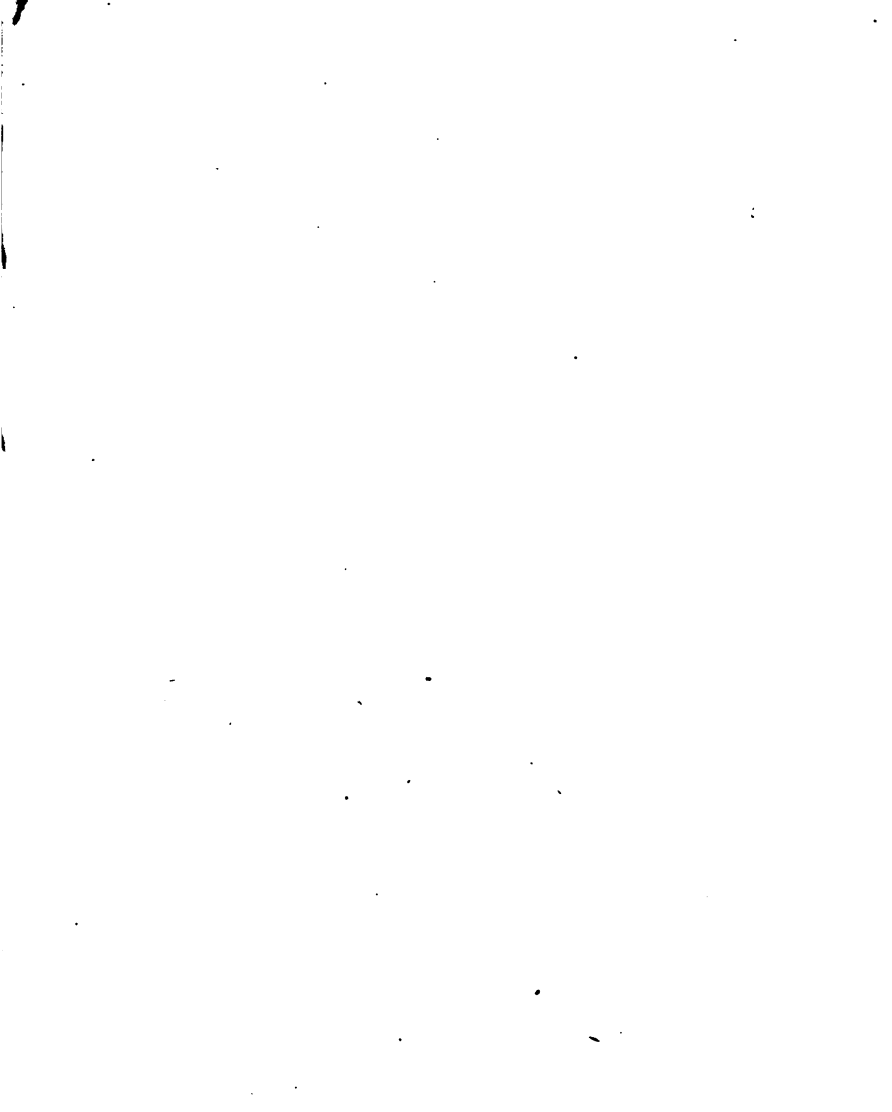












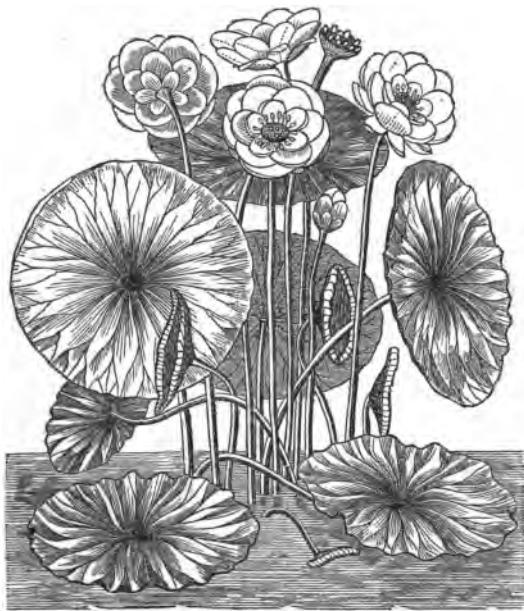


Figure 1. *Nelumbium luteum*, (Nelumbo,) a water plant, frequent in the Western and Southern States. Scapes 3 to 5 feet high. In the cut are shown the leaves, flowers and fruit.

FIRST LESSONS

IN

BOTANY:

DESIGNED FOR

COMMON SCHOOLS IN THE UNITED STATES.

BY ALPHONSO WOOD, A.M.,
AUTHOR OF "THE CLASS-BOOK OF BOTANY."

CLAREMONT, N. H.
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1849.

THE Science of Botany has for its objects the most lovely of all the inanimate works of God. It treats of those beautiful forms which annually unfold themselves to our admiring gaze—which everywhere clothe and decorate the teeming surface of the earth, affording directly or indirectly the sustenance of all animals, and regaling every sense of every creature which has a capacity to be gratified. It is a science peculiarly appropriate to gentle minds. Its cultivation imposes no tax upon the feelings, shocks no sensibility, involves no cruelty. All its incidents and attributes are promotive of health and pure intellectual pleasure.—Why should not such a science be made an indispensable branch of education? As a mere *accomplishment* it is entitled to rank with any of those ornamental acquirements to which so much time is devoted. As a means of enlarging and disciplining the mind, training it to habits of correct observation and profitable reflection, the Study of Plants is far superior to many of those fashionable and fugitive attainments which now so frequently engross the attention of the young. It is a pursuit, too, which carries with it its own reward. The knowledge which it affords is at once pleasing in the acquisition, and of enduring value. It is continually called for, and always ready at command, to minister to the gratification of its possessor, whether in the garden, the field, or the forest.—DR. WM. DARLINGTON.

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SUGGESTIONS TO TEACHERS.

In preparing this little work for the younger portion of the American community, the following well-known principles of Education have been kept constantly in view:—

1. That in the study of any science, *the discipline of the mind* is an attainment of at least equal value with *the acquisition of knowledge*.
2. That to remove from a school book all that is hard to be pronounced or difficult to be understood, is to strip it of all that is truly valuable either in science or discipline.
3. That the *first lessons* which children learn, since they are most likely to be permanent, should contain *truth*, however small the portion, neither simplified to childishness nor glossed with error.

Accordingly, while the author has endeavored to render the First Lessons in Botany as plain and attractive as possible, he has at the same time freely admitted many of the technical terms of Science, with explanations, as being, in part, the very things which the pupil should begin early to comprehend. Neither has he excluded any principle of the Science merely because it is difficult to be understood, and requires *reflection*; but on the contrary, he has even aimed to furnish the child with material for bringing thought and reflection into early exercise.

But the means by which it has been here attempted to place this delightful and ennobling science within the comprehension of the child, are, by a careful definition of all the scientific terms employed, and by limiting the principles here exhibited to a very few in number, and to such as are strictly primary in importance and interest, and primary in the order of nature, simply expressed, and copiously illustrated.

It is also earnestly recommended to teachers to see to it that their pupils thoroughly understand what they recite, by superadding illustrations of thei-

own—by pointing out, in fresh or living specimens, the very form, structure, or property alluded to in the text—by frequent drawings upon the black-board, and more than all, by magnified views with lenses. The more powerful the lens, the more beautiful and wonderful appears the work of the Divine hand in the vegetable structure.

By such means, the learner will soon become ardent in his pursuit; and when his interest in Botany is once excited, there need be no fears for his future progress.

In using the Flora, let the teacher inform his pupils at the commencement, that the design of it is not now to make them acquainted with the Flora of the country, but simply to teach them *how to analyze plants*; therefore they must not expect to find in this little work anything like a full account of all our plants, but only a few plain exercises by which they may trace every Flowering Plant in the United States to its Natural Order, about one in every two to its Genus, and about one in every five to its Species. In conducting an exercise in this Flora with a class of pupils who have well studied the former part of the work, some method like the following would be interesting and profitable. Suppose your class assembled, and each pupil supplied with a specimen of some one species of plants both in flower and with fruit.

Teacher. Are you all ready? Turn to the Flora, and let us find out together the family relations and the names of this fine little plant. John, commence at the "Review of the Natural System" and read the first pair of lines, which we will call a *couplet*.

John (reads). "Plants bearing flowers (Phænogamia).

"Plants never bearing flowers (Cryptogamia)."

Teacher. To which of these great divisions does your plant belong?

John. To the Flowering Plants, sir, for it has both flowers and fruit.

Teacher. Now tell us to which couplet we shall next pass.

John. To the second.

T. Very well. Edward, you may read and determine the second couplet in the same manner.

Edward. "Leaves net-veined, flowers never wholly 3-parted (Exogens)."

"Leaves parallel-veined, flowers 3-parted." My plant seems to be an Exogen, having net-veined leaves and 5-parted flowers. Pass to No. 3.

T. Now let it pass along, and if a wrong decision is made, let those who observe it raise their hands.

Sarah. "Stigmas present. Seeds enclosed in a pericarp (Angiosperms)."

"Stigmas none. Seeds naked." These flowers have pistils, although very small. I think it is an Angiosperma. Pass to No. 6.

Eliza. "Corolla with distinct petals."

"Corolla with united petals." The petals are united in my specimen, forming a tube at base. Pass over to No. 76.

Jane. "Herbs."—"Trees, shrubs, and undershrubs." This plant is an herb. Pass next to No. 77.

Mary. "Stem prostrate or climbing, furnished with tendrils."

"Stem not furnished with tendrils." I do not remember what tendrils are. (*Several hands are raised.*)

T. Edward, do you know what tendrils are?

Edw. Yes. Tendrils are very slender, leafless branches laying hold of other objects for support, coiling and twisting.

T. Are trees or stout herbs ever furnished with tendrils?

Edw. No, sir. They do not need to hold themselves up by other objects; they can stand alone.

T. You are right. And here we see that plants teach us of their Great Creator: for if they had no Creator, but grew up by accident, do you think, Mary, that tendrils would not be as likely to grow on Oak trees as on Grape vines?

Mary. It would be curious indeed to see tendrils on an Oak, neither do I see any tendrils here; so turn to No. 78.

Louisa. "Leaves alternate," &c. These leaves are alternate. No. 79.

Nancy. "Flowers regular."—"Flowers irregular." These flowers are irregular." Turn to No. 90.

Lucy. "Ovary adherent to the calyx tube—inferior."

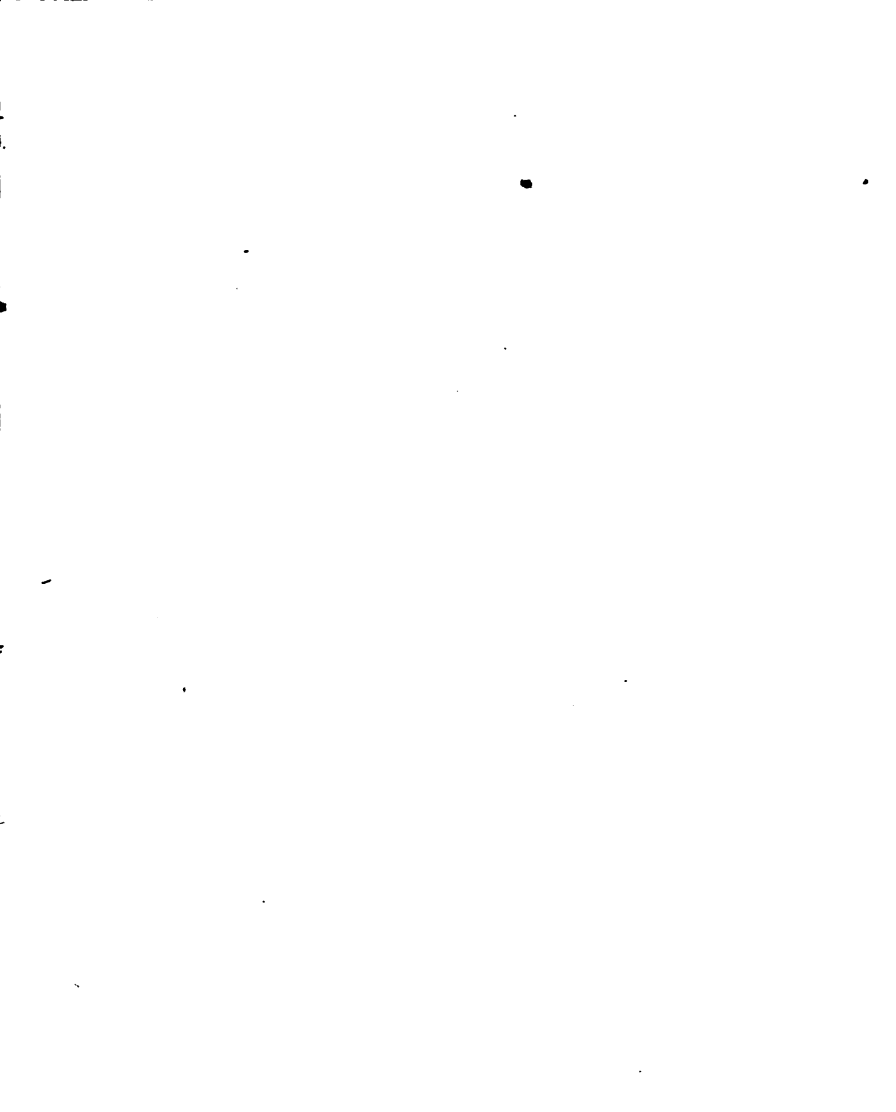
"Ovary free from the calyx tube—superior." These ovaries are very small, but—I now see them plainly with my lens. They are above or inside the calyx, and do not adhere to it. No. 91.

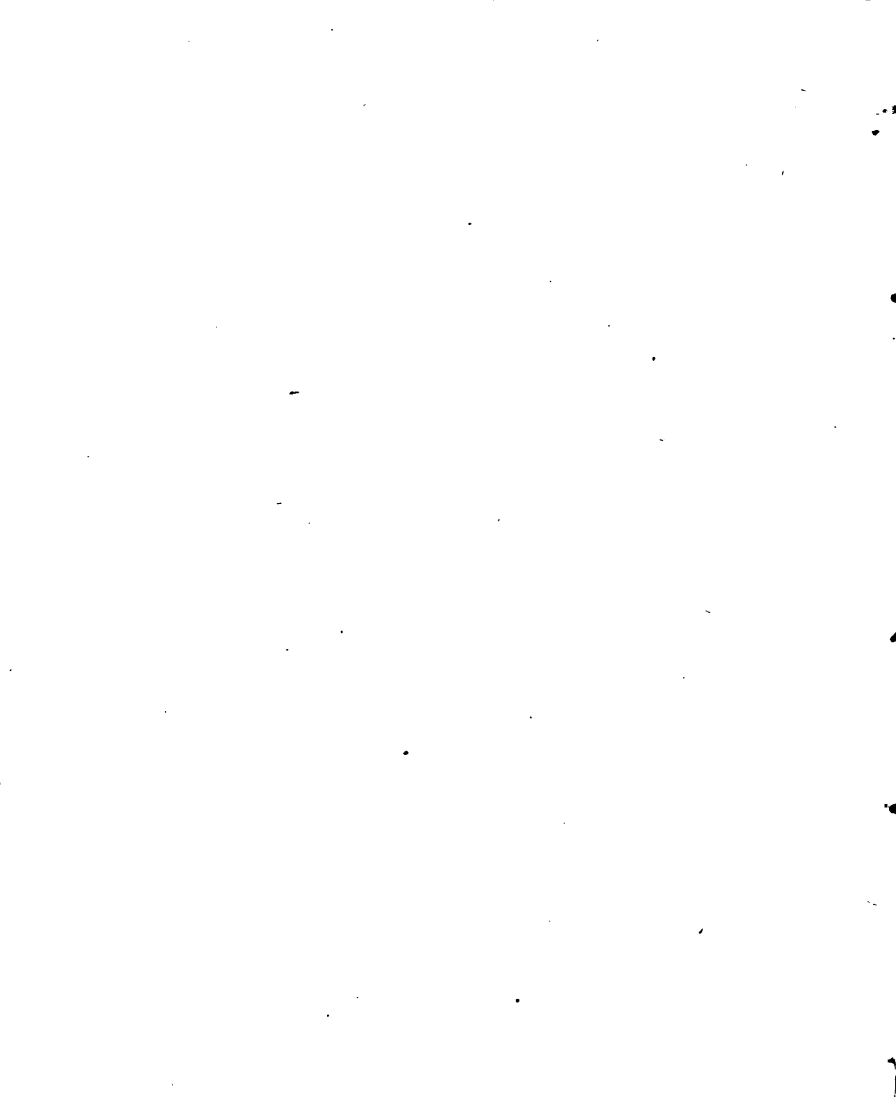
Emily. "Stamens 2, or 4 and didynamous," &c.

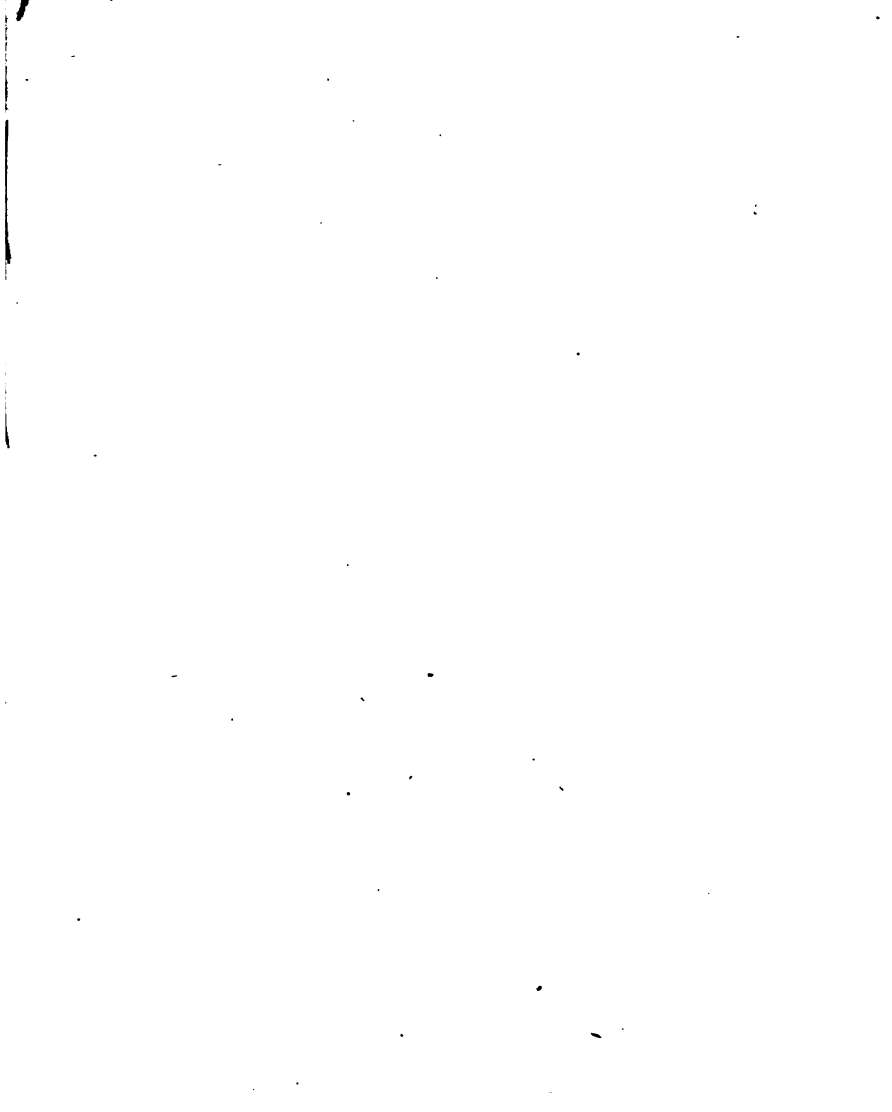
"Stamens 10. Corolla papilionaceous." This plant answers to the last line. We must therefore turn back a great ways to No. 36.

Caroline. "Fruit a 3-celled capsule."

"Fruit a legume with 1 or several seeds." This fruit is so very







ABBREVIATIONS AND SIGNS,

OFTEN USED IN DESCRIPTIVE BOTANY.

ach. achenia.
æst. æstivation.
alter. alternate.
anth. anther.
axill. axillary.
c. common.
cal. calyx.
caps. capsule.
cor. corolla.
decid. deciduous.
diam. diameter.
emarg. emarginate.
f or *ft.* feet.

fil. filaments.
fl. flower; *fls.* flowers.
fr. fruit.
hd. head; *hds.* heads.
hyp. hypogynous.
imbr. imbricate.
inf. inferior.
invol. involucre.
irreg. irregular.
leg. legume.
lf. leaf; *lvs.* leaves.
lflets. leaflets.
ova. ovary.

pet. petals.
r. rare, uncommon.
recep. receptacle.
reg. regular.
rhiz. rhizoma.
rt. root.
sds. seeds.
seg. segments.
sep. sepals.
st. stem.
sta. stamens.
stig. stigmas.
sty. styles.

The names of *months* and of *states* and *countries* are often abbreviated, and in the same manner as in other works; thus, Apr. April; Jn. June. Mass. Massachusetts; N. Y. New York, &c.—In this work, however, the localities of plants are simply designated by the following abbreviations;—

N. Northern, that is, the Northern portion of the United States.

N-E. New England, or the North-Eastern States.

N-W. the North-Western States. E. the Eastern, or the Atlantic States.

W. the Western, or states bordering on the Mississippi and Ohio Rivers.

M. the Middle portions of the United States.

S. the Southern States.

S-E. the South-Eastern, and S-W. the South-Western States.

The following Signs are also in general use:

① An annual plant.

② A biennial plant.

④ A perennial herb.

⊕ A perfect flower, or a plant bearing perfect flowers.

♂ Monœcious, or a plant with staminate and pistillate flowers.

♂♀ Diccious; staminate and pistillate flowers on separate plants.

♂♀ Polygamous; the same species with staminate, pistillate, and perfect fls.

0 Wanting or none.

00 Indefinite or numerous.

† A plant cultivated for use.

This, with the two last, are placed at the end of a description. In other situations they have their usual signification as marks of division or reference. In measure of length, or other dimensions, the following signs are adopted in this work:—

f (without the period), a foot.

" (a single accent), an inch.

" (a double accent), a line (one twelfth of ").

h₂ A plant with a woody stem.

♂ A staminate flower or plant.

♀ A pistillate flower or plant.

⊕ A perfect flower.

♂ Monœcious, or a plant with staminate and pistillate flowers.

♂♀ Diccious; staminate and pistillate flowers on separate plants.

♂♀ Polygamous; the same species with staminate, pistillate, and perfect fls.

0 Wanting or none.

00 Indefinite or numerous.

† A plant cultivated for ornament.

LESSON I.

INTRODUCTION.

1. *What is Science?*—Science is knowledge well arranged, or *classified knowledge*. Thus, Geography is the arranged or classified knowledge of the world and its inhabitants. Grammar is the classified knowledge of language.

2. *What is Natural Science?*—Natural Science relates to the Natural World, and is divided into three departments, according to the three great Kingdoms of Nature.

3. *What are the three great Kingdoms of Nature?*—The Animal Kingdom, Mineral Kingdom, and Vegetable Kingdom.

4. *To which of these does Botany relate?*—Botany is the Science of the Vegetable Kingdom. It includes the knowledge of plants in general—of their habits, structure, uses, names and classification.

5. *Can you define a Plant?*—A plant is a being endowed with life, but not with sense. It lives, grows, and dies, but does not feel or think.

6. *How are Plants related to Minerals and Animals?*—Plants derive their own food from the earth, air and water, that is from the Mineral Kingdom, and from plants is derived the principal nourishment of the Animal Kingdom. In other words, animals feed on plants, and plants feed on minerals.

7. *How does a Plant begin to grow?*—In its earliest state, a plant is a little *embryo* contained in a seed. When the embryo begins to grow, it lengthens in two directions. One part, called the rad-

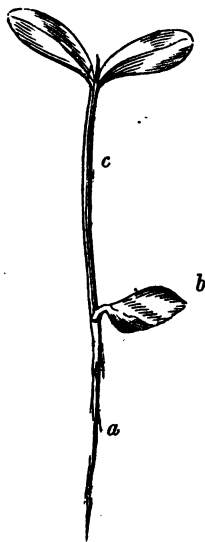


Fig. 2.

icle (rootlet), descends into the dark, damp earth; the other part, called the plumule (little plume), ascends into the air, and spreads itself out to the light.

(Can you make this plain by Fig. 2?—Yes: *b* is the seed from which the radicle, *a*, has grown downward, and the plumule, *c*, upward.)

8. *Of what are Plants composed?*—The matter or substance of plants consists of certain structures, of wonderful form, called the **VEGETABLE TISSUES**. They are of several kinds, but we must not stop to describe them now. (See § 119, 123. Also Class-Book of Botany, pages 21—23.)

9. *What important organ is here to be noticed?*—The **EPIDERMIS** or skin, which envelops nearly every part of the tissues of the plant, where they are exposed to the air.

10. *Mention examples.*—That delicate membrane which may be stripped off from the leaf of the garden Iris, or the Houseleek, is the epidermis. It is always thus transparent and colorless.

11. *What say you of the clothing of the epidermis?*—It is either smooth, or clothed with various processes called hairs, glands, prickles and stings.

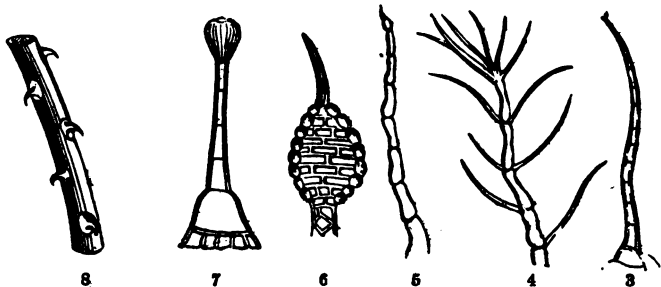
12. *What are hairs?*—**HAIRS** are minute processes drawn out from the epidermis, and made of the same kind of tissue. They vary much in different plants, constituting different kinds of clothing.

13. *When is the surface said to be glabrous?*—When it is smooth, or destitute of hairs, prickles, &c.

14. *Pubescent?*—When it is clothed with short, soft and downy hairs?

15. *Hirsute?*—When clothed with longer hairs.

16. *Scabrous or rough?*—When the hairs are very short and stiff.



(What do these figures represent?—4 represents a branched hair as it appears under a strong magnifier; 5 an unbranched or simple hair; 6 is a hair with a gland on it; 7 also is a gland on the top of a hair; 8 represents the hooked prickles of a rose-bush, not magnified; 3 represents a sting of a Nettle much magnified.)

17. *Toméntose*?—When clothed with short, dense and woolly hairs.

18. *Ciliate*?—When fringed with hairs on the margin. Many other terms of this kind are used, and will be found described in the Glossary.

LESSON II.

CLASSIFICATION INTRODUCED.

§ 1. GRAND DIVISIONS.

19. *Enumerate the parts of a complete plant.*—A full-grown and complete plant consists of five principal parts or organs; namely, root, stem, leaves, flower and fruit; each having its own proper office in the life and growth of the vegetable.

20. *How do plants vary in respect to these organs?*—While most plants possess *all* these organs, there are many kinds which are always destitute of one or more of them. Thus the Ferns and the Mosses have no flowers, and the Lichens (*li-kens*) have neither leaves nor flowers.

(*Explain Fig. 9.*—It represents a *Trillium* (often called *Wake-robin*), with the principal parts or organs a little separated, so as to show them distinctly: *a* is the root; *b*, the stem; *c*, the leaves; *d*, *e*, *f* and *g*, the parts of the flower and fruit, more particularly, *d* is the calyx; *e*, the corolla; *f*, the stamens, and *g*, the pistils which become the fruit.)

21. *State, now, the two grand divisions of the Vegetable Kingdom.*—In consequence of this, the whole Vegetable Kingdom has usually been considered, by botanists, under two great natural divisions, which are,

I. The Phænogâmia (fen-o-gà-mi-a), or Flowering Plants, and

II. The Cryptogâmia, or Flowerless Plants.

22. *Distinguish them by their fruit also.*—The Flowering Plants produce seeds, each of which has within it an *embryo*, or little plant; but the Flowerless plants produce *spores* instead of seeds.

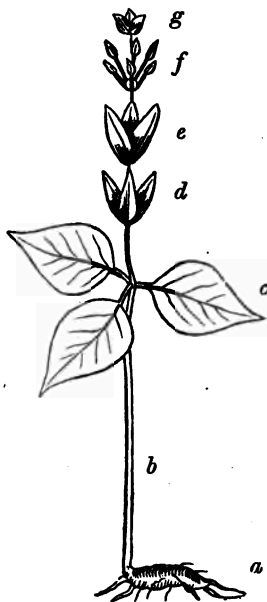


Fig. 9.

23. *What are SPORES?*—They are certain little bodies appearing like particles of dust, having no embryo, or little plant, within them; such, for example, as the fruit of a Fern plant, growing in little brown spots upon the back of the leaf. (Figs. 10 and 11.)



10. *Blechnum.*



11. *Polypod.*

(In the following pages, we shall speak of the organs of the Flowering Plants only.)

§ 2. GENERA AND SPECIES.

24. *What is a species?*—A SPECIES of plants embraces all such individuals as are of the *same kind*, having originated from the same stock. Such plants bear a strict resemblance to each other, as well as to the common parent, in all their parts.

25. *Please illustrate your meaning.*—The *White Clover* is a species, called, in the Latin language, *Trifolium repens*. Under this species, we include millions of individual plants, scattered over the hills and plains, all of a common descent, and producing other individuals of their own kind from their seeds.

26. *How many species of plants are known?*—The vast multitude of individual plants which clothe the surface of the earth, are classified into more than eighty thousand (80,000) known species.

27. *What is a Genus?*—A GENUS is an assemblage of species which have more points of resemblance than of difference; in other words, which agree in more respects than they disagree.

28. *Please illustrate.*—The genus *Clover* (Latin, *Trifolium*) includes the species *White Clover* (*T. repens*), *Red Clover* (*T. pratense*), the *Yellow Clover* (*T. agrarium*), and many others; which we call, in conversation, *different kinds* of *Clover*. The genus *Pine* (*Pinus*) also, includes the *White Pine*, the *Pitch Pine*, the *Norway Pine*, and many other *kinds*, all closely similar in *most* respects, but plainly different in *several*.

29. *What is the number of genera now known?*—About twenty thousand (20,000).

LESSON III.

OF THE ROOT.

30. *Please state the general character of the root.*—The *ROOT* is the basis of the plant, and the principal source of its nourishment. It originates with the radicle (§ 7) of the seed, grows downward, and is generally buried in the soil.

31. *How distinguished from stems?*—By its downward direction, by its thread-like fibres, by the irregular arrangement of the branches, and the absence of buds and pith.

32. *What are the principal parts of the root?*—The caudex, fibrils and spongelets.

33. *Describe the CAUDEX or stock.*—It is the main body of the root.

34. *The FIBRILS.*—These are the finer branches of the roots, usually no larger than threads.

35. *The SPONGELETS.*—The tender and delicate *extremities* of the fibrils, at which they absorb moisture and food, and from which they grow.

36. *What is the most common form of roots?*—The *branching root* (Fig. 12), like those of trees and shrubs. It divides and subdivides, sending off branches from the main stock, but in no regular order.

37. *What say you of the roots of trees?*—They extend to no great depth, but in all directions beneath the surface, and to distances equal to, and sometimes far greater than, the height of the tree. Forest trees, being less exposed to wind, are less firmly rooted than trees in open situations.

38. *The FIBROUS ROOT?*—All roots are fibrous, more or less; but only those roots are properly called fibrous, which consist almost wholly of thread-like divisions sent off directly from the base of the stem, without a caudex. Such are the roots of most of the grasses (Fig. 13.)

39. *The FLESHY ROOTS—what is said of them in general?*—The root often serves as a *store-house* for the plant, and becomes thick and fleshy in consequence of the nutritious matter stored away in its tissues, against the time of flowering.

40. *Of what does this nutritious matter generally consist?*—Of starch.

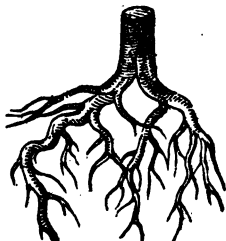


Fig. 12.



Fig. 13.

41. *Please describe some of the forms of fleshy roots, beginning with the fasciculate (Fig. 14).*—Fasciculated roots are like the fibrous, having some of the fibres thickened, as in the Crowfoot, Pæony and Dahlia.



Fig. 14.

42. *The fusiform (Fig. 15).* The spindle-shaped; consisting of a thick, fleshy caudex, tapering downward, and sending off many fibres from the sides and end. These fibres are, in fact, the true roots, since they alone absorb nourishment from the ground. The Beet, Carrot, and Parsnip are examples.



Fig. 15.

43. *The premorse root.*—It is a variety of the fusiform, in which the caudex ends abruptly at the lower end as if *bitten square off*, as in the Foot-leaved Violet (*Viola pedata*, Fig. 16).

44. *The napiform root.*—This is another variety of the fusiform, in which the upper portion swells out so that the diameter is as great as the length, as in the Turnip (Fig. 17). Neither of these kinds is very common.

45. *But some roots are not fixed in the soil: will you describe them particularly?*—Some are *floating*, and always suspended in the water, as those of the Duckmeat (Lemna). Others fix themselves on other plants, but derive their nourishment chiefly from the air; as, the Ivy, Poison Ivy, &c. Such roots may be called *aërial*.

46. *Describe the parasite roots.*—The roots of certain plants, called parasites, penetrate the bark and draw their nourishment from the juices of other plants which support them; as, the Dodder.



Fig. 16.

47. *What say you of the duration of roots?*—They are either annual (denoted in description by this mark ①), or biennial (②), or perennial (④).

48. *What are annual roots?*—① They are roots which die with the whole plant at the end of the first season, immediately after the fruit is matured; as, the Cotton plant, Rice, and Indian Corn.



Fig. 17.

49. *Biennial?*—② Such as do not usually bear fruit the *first* season, but exhaust their stores of nutriment the *second* season by fruit-bearing, and immediately die. Such are the fusiform, napiform, and thickened roots generally.

50. *Perennial?*—④ These survive fruit-bearing, and live many years; as the Butter-cups, Rose, and all trees and shrubs.

51. *What is the most obvious use of the root?*—To fix the plant in the soil, and maintain its upright position.

52. *The most important use?*—The most important use of the root is *absorption*, or drawing from the soil that moisture and food which its growth absolutely requires.

53. *What part of the root performs this office?*—Not the whole surface, but only the spongelets at the ends of the fibrils, where the tissue is loose and spongy. From the spongelets the sap is conveyed by the tissues of the fibrils to the main root, and thence carried up by the stem, and distributed to all parts of the plant.

LESSON IV.

OF THE STEM.

§1. ITS OUTWARD FORMS AND ORGANS.

54. *You may repeat the general definition of the stem.*—The STEM is that part of the plant which originates with the plumule (§ 7) and grows upward, expanding itself to the influence of the air and the light.

55. *What is said of the direction of the stem's growth?*—Although the first direction of the stem's growth is upward, yet there are many plants in which it does not continue so, but extends itself in an oblique or horizontal direction, either just above the surface of the ground, or just beneath it.

56. *Can you state the varieties of the stem in this respect?*—When the stem continues to arise upward toward the zenith, it is said to be *erect*. When it grows horizontally upon the surface of the ground,

it is then *creeping, trailing* or *procumbent*. When it arises obliquely, it is an *ascending* stem, and when it never arises above the surface of the ground, it is called a *subterranean* stem.

57. *Can you state the varieties of the stem in respect to duration?*—The same as in the root; viz., an ① *annual* stem lives but one season, then dying, at least, down to the root: a ② *biennial* lives two years, and a ④ *perennial* exists beyond two seasons, to an indefinite period of time.

58. *How do you classify plants in respect to the size and form of the stem?*—Plants are distinguished or classed into trees, shrubs and herbs.

59. *What is a TREE?*—It is a plant with a firm, woody stem or *trunk*, which does not divide into branches for a certain distance above the ground. The Elm, Sugar Maple and Palm are examples.

60. *What is a SHRUB?*—A shrub is a plant of smaller dimensions than a tree, having a perennial, woody stem, which divides into branches at or near the surface of the ground, like the Alder and Berberry.

61. *What shall we call a shrub of diminished size, like the Low Blueberry?*—An *UNDERSHRUB*.

62. *What is an HERB?*—An herb is a plant with an annual, biennial or perennial root, producing stems which, above the ground, endure but a single season, and do not become woody. Examples, ① Mullein, ② Parsnip, ④ Butter-cups.

2. OF THE ORIGIN AND ARRANGEMENT OF BRANCHES.

63. *Please state a special characteristic of stems.*—The formation of buds. At the commencement of its growth, the stem itself is a bud.

64. *Classify buds.*—Buds are of two kinds: the leaf-bud and the flower-bud—the former containing the elements of a leafy branch, and the latter the same elements changed into the organs of a flower.

65. *Describe the leaf-bud more particularly.*—A leaf-bud consists of a little tender growing point connected with the pith, surrounded and protected by a covering of young leaves and scales.

66. *Can you tell me what is said concerning the Simple Stem?*—The plumule, which is in fact the *first bud*, grows at first in one direction only, and forms a simple stem (that is, without branches); and being itself continually renewed, it is always borne at the end or summit of that stem: in other words, *the stem is always terminated by a bud* (Fig. 18, *t*).

67. *Where else are buds formed?*—Besides this terminal bud, there is also always a bud in the axil of each leaf (Fig. 18, *a*, Fig. 19, *b*). These are therefore called axillary buds.

68. *Where is the Axil of a leaf?*—It is just above the origin of the leaf-stalk.



Fig. 18.

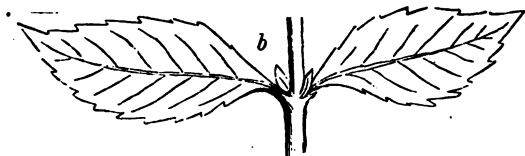


Fig. 19.

69. *How are the branches of the stem formed?*—By the growth of these axillary buds. But if these buds remain inactive, no branches will be formed at all, and the stem will remain simple, as in the Mullein.

70. *How, then, do you define a Branch?*—A BRANCH is a division of the stem, produced by the growth of an axillary bud.

71. *What is signified by Nodes and Internodes?*—That point of the stem where the leaf with its axillary bud is produced, is called the *node*, and the space between two adjacent nodes is called an *internode*.

72. *What will you now say concerning the arrangement of the branches?*—Since they arise from axillary buds, their arrangement

upon the stem will depend upon the arrangement of the leaves. In all *young* plants, at least, they are arranged with much regularity.

73. *What is the general law of arrangement?*—Leaves, and all other appendages of the stem, are arranged spirally, that is, in a line that winds around the axis like the threads of a screw. But to this law there seem to be many exceptions.

74. *Describe the Alternate arrangement.*—When only one leaf arises at each node, the arrangement is evidently spiral, and is called *alternate*.

75. *The Opposite?*—When two leaves arise at one node, they are placed *opposite* to each other, and at *right angles* to the next pair above or below. (Fig. 19.)

76. *The Verticillate or Whorled?*—When three or more leaves arise at each node, they are placed in a circle, and are said to be *whorled*. (Fig. 20.)



Fig. 20.

77. *How, then, are the branches arranged?*—In like manner, the arrangement of the branches is found to be originally spiral or *alternate* in most plants, *opposite* in the Maple, &c., *verticillate* in the Pine, &c.

§ 3. OF THE SUBTERRANEAN STEM.

78. *What is the stem sometimes called in botanical works?*—The *ascending axis*.

79. *Does every plant have a stem or ascending axis?*—Yes; this part must necessarily exist in every Phænogamous plant (§ 21), but it is very variable in form, position and structure.

80. *Does the stem always reach the surface?*—It has already been stated (§ 55), that although the first tendency of the stem is upward, yet it does not always continue to arise, or reach the surface of the ground. Therefore, stems are classified into AERIAL and SUBTERRANEAN.

81. *Can you here explain the term Acaulescent?*—It means *stemless*, and is used (improperly) to describe such plants as have only subterranean stems; as, the Dandelion, Primrose and Tulip. Such plants were formerly supposed to have no stems at all. (See figures).

82. *Enumerate the varieties of the subterranean stem.*—The principal varieties are the bulb, corm, tuber, rhizoma and creeper; all of which are often mistaken for roots.

83. *Describe the bulb.*—

The BULB is a kind of subterranean bud, consisting of a very short stem, bearing an oval mass of short, thickened scales above, closely packed in circular rows or layers, emitting a branch or a flower-stem from the axil of one of the scales and roots from the base.

(Fig. 21 is a scale-bulb; 22, the same cut through perpendicularly, showing the inner structure.)



Fig. 21.



Fig. 22.

84. *The varieties of the bulb.*—The *scaly* bulb consists of many close-packed, over-laying scales, as in the Lily; but in the *tunicated* or *coated* bulb each layer consists of one entire piece enclosing all within it; as in the onion (Fig. 23). But this kind is not common.



Fig. 23.

85. *What are bubblets?*—BULBLETS are small bulbs formed in the axils of the leaves upon the stem, at length ripening, falling to the ground and rooting, and producing a perfect plant. Such plants are said to be *bulbiferous*; as, the Tiger Lily (*Lilium tigrinum*).

86. *A Corm?*—A CORM is the thickened base of a stem, resembling a bulb in form and position, but differing in structure, being *solid*, and not scaly or coated. Example, Indian Turnip (*Arum*, Fig. 24).

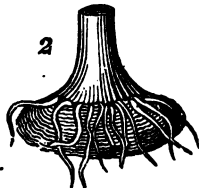


Fig. 24.

87. *A Tuber?*—This is an annual, thickened portion of a subterranean stem, provided with buds (called eyes) from which new plants arise the succeeding year. The potato is an example (Fig. 25).



Fig. 25.

88. *A Rhizoma or root-stock?*—It is a prostrate, thickened, rooting stem, either partially or wholly under ground, often furnished with scales which are the rudiments of leaves, or marked with scars which show where leaves once grew, and yearly producing shoots upward and roots downward.

89. *Give examples.*—The fleshy, horizontal portion of the Bloodroot (Fig. 26), Sweet Flag, and the Bramble are rhizomas.

90. *Describe the Creeper.*—It differs from the rhizoma only in size, consisting of slender jointed stems and branches, very hardy, extending horizontally in all directions beneath the surface, sending out branchlets and roots at intervals. The Couch-grass (*Triticum repens*) is an example.

91. *Of what use are creeping stems?*—They frequently abound in loose, sandy soil, which they bind down and secure against the washing of rivers, floods, and even the waves of the sea.

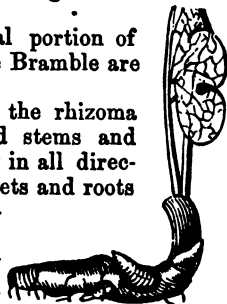


Fig. 26.

92. *Give an example.*—The country of Holland, in Europe, is said to owe its existence to certain plants with creeping stems, by which its shores are apparently bound together. Much of the surface of that country is lower than the level of the sea. To prevent inundation, walls of earth, called dykes, have been built, with immense labor, along the coast. These dykes are overgrown by certain Grasses and Sedges, whose innumerable creepers and roots resist the perpetual washing of the waves.

§4. OF AERIAL STEMS.

93. *Define the term, Cauliscent.*—It is derived from the Latin word *caulis*, a stem, and is frequently applied to those plants

which have aerial stems, to distinguish them from acaulescent plants (§ 81).

94. *Enumerate the varieties of aerial stems.*—The culm, runner, scape, vine, trunk, sucker, offset, stolon, and thorn.

95. *Give the definition of a culm.*—A **CULM** is that form of stem which is peculiar to the Grasses and grass-like plants. It is jointed, and usually green and herbaceous. But this distinction seems hardly necessary.

96. *A Runner.*—This is a prostrate, thread-like (filiform) stem or shoot, extending itself along the surface of the ground, and throwing out roots and leaves at the extremity. The roots strike into the soil, form a new plant which soon becomes independent of the parent; as in the Strawberry (Fig. 27, *a, a*).

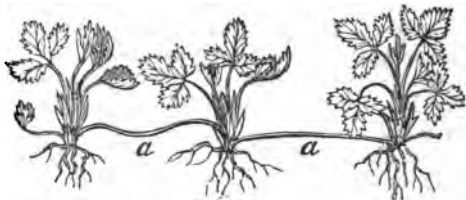


Fig. 27.

97. *A Scape*—This is a flower-stalk, springing from a subterranean stem, and bearing the flowers of the plant but not the leaves; as in the Dandelion, Tulip, Dodecâtheon (See figures).

98. *What of the leaves of such plants?*—They are **radical**; that is, they spring from the root or under-ground stem also.

99. *A Vine.*—It is a stem which, being too weak to stand erect, creeps along the ground, or any convenient support, and does not strike root, like the runner. The vine sometimes supports itself on other plants, &c., either by *tendrils*, as in the Grape, or by twining itself, as the Hop.



Fig. 28.

100. *What is a Tendril?*—It is a leafless, slender, coiling organ, either formed of a degenerate branch (as in Fig. 28, *b b*), or growing out

of the leaf-stalk, or it may be the extended mid-vein (§ 158) of the leaf (Fig. 29).

101. *Its manner of growth?*—Its first growth is straight, until it meets with some object, when it immediately turns and coils itself about it, and thus acquires a firm, but elastic hold. This beautiful appendage is finely illustrated in the Gourd, and Grape; also in the Pea, where it grows from the ends of the leaves (Figs. 28, 29).



Fig. 29.

102. *Describe a Twining Vine.*—This stem, having also a very slender form, supports itself on other plants or objects by entwining itself around them, being destitute of tendrils. Thus the Hop-vine mounts into the air by foreign assistance.

103. *Mention a curious law among twining plants.*—All twining plants of the same species turn and wind in the same direction. If you look through a field of Hops you will find every vine winding with the sun, that is, from left to right.

104. *Describe the Trunk.*—This is the name given to the peculiar stems of trees. It is the central column or axis which supports their branching tops. By means of the great strength and firmness of the woody tissue of which it is composed, it long withstands the assaults of the winds.

105. *What can you say of the dimensions of the trunk?*—It often attains to great dimensions. The White Pine of the Northern States, with a diameter of 4 to 7 feet, sometimes reaches the lofty height of 180 to 200 feet, having a trunk straight, erect, and without a limb for two-thirds this height. The Tulip-tree (*Liriodendron*) arises 120 feet, with a trunk from 6 to 8 feet in diameter.

106. *What of the duration of trees?*—Some trees attain their growth in a few years, and immediately decay; but, in general, the age of trees is beyond the age of man, and some outlive many generations, as the Oak and Pine.

Fig. 30.



107. *Describe a Sucker.*—It is a branch which springs from a point of the stem which is beneath the ground, producing leaves, and

at length striking root from its own base, and becoming an independent plant; as in the Rose (Fig. 30, *ff*).

108. *A Stolon*.—This is a branch springing from the main stem *above* the ground; but bending down, it strikes root in the soil from the apex or some other part, and finally becomes an independent plant. Plants that multiply thus are said to be *stoloniferous*.

109. *A Thorn*.—A *thorn* or spine is a deformed leafless branch, stunted, hardened and pointed, arming the plant as if in self-defence; as seen in the Thorn-bush and Honey Locust. Such plants are said to be *armed*, and other plants *unarmed* (Fig. 31).



Fig. 31.

LESSON V.

OF THE INTERNAL STRUCTURE AND GROWTH OF STEMS.

§ 1. EXOGENS.

110. Thus far we have been considering only the outward forms and features of stems. Let us now take notice of their internal structure. But as our young readers are not now prepared to enter upon a *thorough* examination of this subject, we shall omit every thing except what is necessary to aid them in distinguishing the two great subdivisions of Flowering Plants, called the Exogens and the Endogens.

111. *Now let us hear a general definition of the Exogens*.—The Exogens are those plants which grow by the addition of new matter made upon the *outside* of the wood annually.

112. *Give examples*.—All the trees and the greater part of the shrubs and herbs of temperate and cool climates are Exogenous Plants.

113. *Give a general definition of the Endogens*.—The Endogens are those plants whose stems grow by the introduction of the new wood into the interior of the old.



Fig. 32. EXOGENS—Oak, Fir, &c.

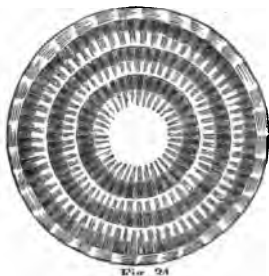


Fig. 33. ENDOGENS—Palm, Agave, &c.

114. *Give examples.*—All the Grasses and Sedges, and all bulbous plants in temperate climates, and all Palms and Canes of warm climates, with one or two shrubs in cool climates are Endogenous Plants.

115. *How shall we best examine the internal structure of the stem?*—By cross sections.

116. *Please explain your meaning.*—A cross-section is made by cutting the



stem square off with a keen knife. Fig. 34 represents such a cutting or section of an Exogen; as, an Elm, Cherry, Rose, Birch.

117. *State the three main parts of an Exogenous stem.*—On examining such a section, you will see that it contains a roundish *pith* (*a*) in the centre, then one or more rings of wood (*d d d*), and on the outside a covering of bark (*b*).

118. *State a fourth part.*—Besides these parts, if the stem examined be more than a year old, you will see also a number of fine, silvery lines, running like rays from the pith to the bark. These rays are called the *MÉDULLARY RAYS* (*c c c c*, Fig 35).

119. *Describe the Pith.*—The pith occupies the central part of the stem, and consists of a light, porous tissue, which we call cellular tissue (Fig. 36), or a tissue consisting of little, roundish cells. In young plants the pith is large, and filled with fluids; but as the plant grows old, the pith becomes dry and diminished in size.

120. *The Médullary Rays.*—These extend from the pith to the bark, through the woody layers, and consist of thin plates of cellular tissue, of the same origin as the pith.

121. *How may these rays be best exhibited?*—By splitting a billet of Oak or Maple in the same direction with them. They are often called the *silver grain*.

122. *The Wood.*—The wood is composed of circular layers or hollow cylinders, one within another, penetrated by the medullary rays. It consists of firm tissues of several kinds, but chiefly of what is properly called *woody tissue*.

123. *Can you give any farther account of this kind of tissue?*—Here is a representation (Fig. 37) of a small portion of woody tissue, greatly magnified; it appears to be made up of lengthened cells, wrought into string-like fibres.

124. *How is the age of the tree indicated, and why?*—The

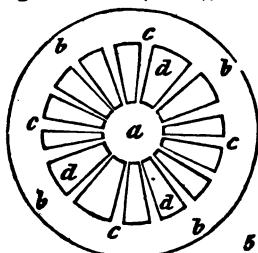


Fig. 35.

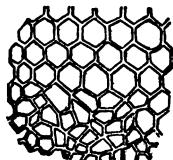


Fig. 36.



Fig. 37.

pith and the inner layer are the first year's growth. One new layer is formed each successive year during the life of the plant. Hence the whole number of layers, if counted near the ground, will show the age of the tree.

125. *Will you describe the Albúrnium?*—The outer and newer layers constitute that part of the wood which is called the *sap-wood*, *white-wood*, or, more properly, the *albúrnium*. This is usually softer and of a lighter color than the rest of the wood, and it is through the tubes and vessels of these layers alone that the sap ascends.

126. *And also the Duràmen?*—As these layers become old, their vessels are gradually filled with solid matter, until they can no longer admit fluids to pass through them. Thus the *DURÀMEN* or *heart-wood* is formed, which is more firm, durable and useful in the arts.

127. *How does it appear that the duràmen is not necessary to the life of the tree?*—We often notice trees in the forest whose *duràmen* has rotted and disappeared, leaving the trunk hollow, while they are still as vigorous and flourishing as ever.

128. *Just mention the three coats which compose the Bark?*—The bark consists, 1st, of the *epidérmis* (§ 9) enclosing the whole vegetable; 2d, the *green* or *corky bark*; and, 3d, the *white bark* within, called the *liber*, which is easily separated from the wood.

129. *When and where is a new layer formed?*—At the end of the spring, between the bark and the wood.

130. *Can you describe the process?*—A portion of the sap, now thickened and changed in the leaves, as it descends is poured out between the liber and the wood, forming a new layer upon each. First, new cells like those of the pith are formed (§ 119), and immediately new tubes and fibres of woody tissue, commencing at the leaves, grow downward through the cellular matter, and complete the layers.

131. *State, in brief, the principal office of the stem.*—Its principal office is, to convey the sap from the roots to the opposite extremities of the plant. This takes place through the tubes and woody fibres of the *albúrnium*, which extend even to the leaves.

§2. OF THE ENDÓGENOUS STRUCTURE.

132. *Will you briefly describe the structure of Endogens?*—In the endogenous stem there is no distinction of pith, wood and bark ; neither does a cross section (§ 116) show any appearance of annual layers.

133. *Of what is their substance composed?*—The substance of these stems is composed of the same materials as that of Exogens ; that is, of cellular tissue, woody fibre, &c. : but the former exists equally diffused throughout all parts of the stem, and the rest are imbedded in it, in the form of little bundles of fibres. (See Fig. 38, which represents a cross-section of an Endogenous stem.)

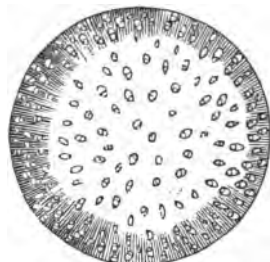


Fig. 38.

134. *How do the new bundles grow?*—These bundles of wood, resembling threads, commence at the leaves and grow downward, penetrating through the midst of the cellular substance of the stem ; so that the central portions of endogenous stems will always be found to be the newest.

135. *Point us to some examples of Endogens.*—The Green Brier is a northern, and the Palm is a southern example of woody Endogens, and the Broom-corn is a fine example of an herbaceous Endogen.

LESSON VI.

THE LEAF.

136. *How would you characterize the leaf?*—The LEAF constitutes the verdure of plants, and is the most conspicuous and beautiful object in natural scenery.

137. *What say you, in general, of its form?*—It has a thin and expanded form, presenting the largest possible surface to the air and light.

138. *What is the color of the leaf?*—The leaf is almost universally green, which, of all colors, is the most agreeable to the eye; but it varies by almost infinite shades, and is often finely contrasted with the more delicate tints of the flower.

139. *Have you noticed their autumnal hues?*—Yes. Toward the end of the season, their *verdure* is changed, often to the most brilliant colors, as crimson, scarlet, orange, yellow, decking the forests in wonderful splendor.

§ 1. ARRANGEMENT AND POSITION.

140. *What is related of their arrangement upon the stem?*—In the bud, their arrangement is nearly or quite *circular*, but by the lengthening of the axis into a stem or branch, this arrangement is changed in various ways.

141. *What is the Alternate arrangement?*—It is where the leaves are placed one above another, on different sides of the stem, only one at each node (§ 71); as in the Elm, Willow, Butter-cups.

142. *The Opposite?*—Two leaves at the same node, placed over against each other; as in the Maple, Hydrangea, Sage.

143. *The Verticillate or Whorled?*—More than two at the same node, placed in a circle; as in the Meadow Lily.

144. *Fasciculate or Tufted?*—In crowded whorls or spirals; as in the Water-starwort.

145. *Radical leaves?*—This term refers to the position of the leaves upon the plant. Those leaves which grow out of the stem at or just beneath the ground so as to appear as if they grew out of the root, are called *radical* (See figures).

146. *Cauline and ramial?*—*Cauline* leaves grow from the stem (*caulis*) above ground, and *ramial* grow from the branches (*rami*).

§ 2. STRUCTURE.

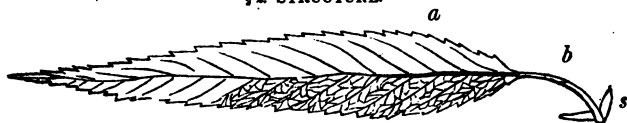


Fig. 39, A Willow Leaf.

147. *Please define, carefully, a leaf.*—A leaf may be regarded as a portion of the two outer coats (§ 128) of the bark, extended into a broad, thin expansion by means of a woody frame-work or skeleton proceeding from the interior of the stem. This broad, thin part is called the **LAMINA** or **BLADE** of the leaf (*a*, Fig. 39).

148. *How is the leaf supported?*—Usually by a foot-stalk, which we call the **PETIOLE** (*b*, Fig. 39), and the leaf is then said to be *petiolate*. But the petiole is often wanting, and the leaves stand directly upon their base. They are then said to be *sessile*. (In Fig. 39, *s* represents *stipules*.)

149. *What is the usual form of the petiole?*—Slender and nearly cylindrical, with a groove upon the upper side—sometimes quite cylindrical.

150. *Define a Compressed Petiole.*—The petiole is said to be *compressed* when it is flattened sideways or vertically, so as to be agitated by the slightest breath of air; as, the Aspen or Poplar. Such leaves can scarcely be at rest in any position.

151. *A Winged Petiole.*—A winged petiole is expanded sideways or horizontally into a border or margin; as, the Lemon, Orange.

152. *A Sheathing or Amplexicaul Petiole.*—This kind is expanded at the base into a margin which surrounds and embraces the stem; as in the Angelica, Caraway, and all others of the Umbelliferae.

153. *Can you state the general form of the lamina?*—The lamina has generally a rounded outline, longer than wide, with equal sides but unequal ends. That end next the petiole or the stem is the *base*, and the other is the *apex*.

154. *Can you distinguish the Simple and the Compound Leaf?*—A leaf is simple when its blade consists of a *single piece*, however cut,

cleft or divided it may be ; and *compound* when it consists of *several distinct blades*, supported by as many branches of a *compound petiole*. See the Rose leaf and the Clover leaf for examples.

§ 3. VENATION OF THE LEAF.

155. *Give an account of the frame-work, or skeleton of the leaf.*—It consists of all those branching vessels of the petiole which we see running throughout the blade, in all directions. Speaking of them collectively we call them **VEINS**, because, like veins in animals, their office is to convey the nourishing fluids.

156. *Will you define the word venation?*—*Venation* is a term denoting the manner in which the veins are divided and distributed.

157. *Let us hear you classify the veins.*—They are divided into four kinds, differing from each other only in size and position, called the *midvein*, *veins*, *veinlets* and *veinulets*.

158. *Describe the midvein and the veins (v).*—The **MIDVEIN** is the chief prolongation of the petiole, running directly through the blade, from the base to the apex, as we observe in the leaf of the Willow, Elm and Magnolia (Fig. 39, *m*). If there be several similar divisions of the petiole, radiating from the base of the leaf, as we see in the Maple and Cotton plant, we call them all **VEINS**, and the leaf is said then to be *three-veined*, *five-veined*, &c.

159. *What are the Veinlets?*—The principal branches sent off from the midvein or veins. See them in the birch leaf, running straight to the teeth.

160. *What the Veinulets?*—These are the branches sent off from the veinlets. See them in this figure. (39, *a*).

161. *Is there more than one mode of venation?*—There are three, and they are severally characteristic of three great divisions of the Vegetable Kingdom.



Fig. 39.



FORMS OF VENATION.—40, 41, Exogens; 43, Endogen; 42, Acrogen.

162. *Please mention the first mode.*—It is the *reticulate* or *net-veined*, (Figs. 40, 41,) where the veins all branch and subdivide as they spread through the leaf in all directions, and the fine branchlets unite again so as to form a net-work of veinulets all over the leaf. Such are the leaves of the Exogens generally (§ 111).

163. *The second mode.*—The *parallel-veined* venation (Fig. 43), in which the veins are all parallel with each other (whether they proceed from the base of the leaf to the apex, or are sent off from the midvein to the margin), and are connected by simple veinlets running crosswise. Such are the leaves of nearly all the Endogens, as the Grasses, Canes, Tulip.

164. *The third mode.*—The *fork-veined* (Fig. 42), where the veins all divide and subdivide by forked divisions which do not unite again. Such are the leaves of the Cryptogamia generally.

165. *How do you classify the net-veined leaves?*—Into two forms, namely, the *feather-veined* and the *radiate-veined*.

166. *Describe the first.*—The *feather-veined* leaf (Figs. 39, 40) is one in which the venation consists of a midvein, giving off, at intervals, veinlets from each side, and branched veinulets; as in the Beech, Pawpaw, Magnolia.

67. *Describe the second.*—The *radiate-veined* leaf (Fig. 41) is one in which the venation consists of several veins (§ 158) of nearly

equal size, radiating from the base of the leaf to the margin, each with its own system of veinlets and veinulets. The Maple, Crow-foot, Cotton, afford good examples.

§ 4. FORM OR FIGURE.

168. *Will you enumerate the various forms of the feather-veined leaves, beginning with such as have the middle veinlets longest?*

1. *Orbicular* or roundish; as in several species of *Pyrola* (Fig. 44).

2. *Elliptical* or oval; as in the Checker-berry (*Gaultheria*) (Fig. 45).

3. *Oblong* or narrow-oval; as in *Arenaria lateriflora* (Fig. 46).

169. *Enumerate three forms which have the lower veinlets longer than the rest.*

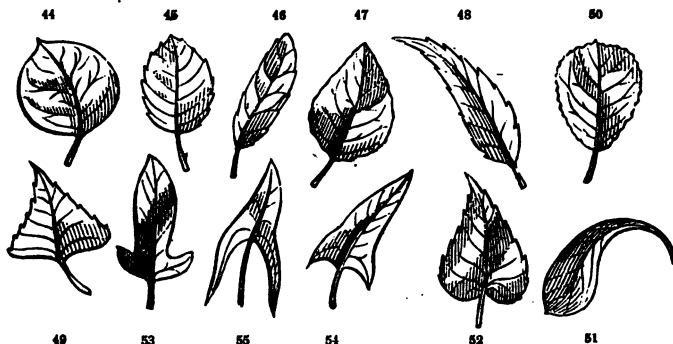
4. *Deltate*; triangular or three-sided, like the Greek letter delta (Fig. 49).

5. *Ovate* or egg-shaped; as in the False Syringa (Fig. 47).

6. *Lanceolate*, or lance-shaped; narrow and tapering to each end; as in Sweet-william, Smart-weed (Fig. 48).

170. *Mention two forms in which the upper veinlets are the longer.*

7. *Obovate*, or inversely egg-shaped, having the upper end broader than the lower; as in the Walnut (Fig. 50).



Figures of feather-veined leaves.

8. *Spátulate*, shaped like a spatula ; as in the Daisy (Fig. 51).

171. *Enumerate five in which the lower veinlets are the longer, sending off veinulets backward.*

9. *Cordate* or heart-shaped, like the ovate form, with a sinus or hollow at base, as in the Lilac (Fig. 52).

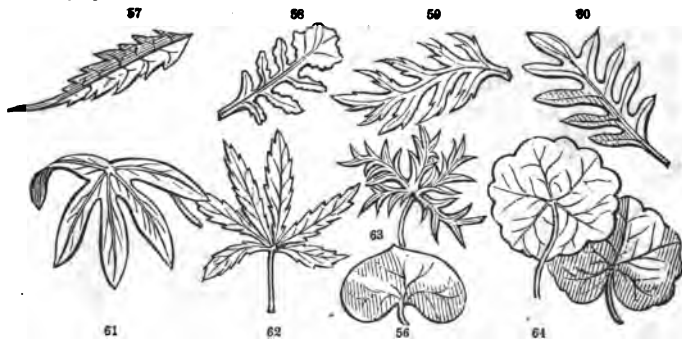
10. *Aurícuate*, having ear-shaped lobes at the base ; as in Sorrel (Fig. 53).

11. *Hastate*, hollowed out at the base and sides ; as in Bitter-sweet (Fig. 54).

12. *Sagittate*, arrow-shaped, with pointed, descending lobes at base ; as in *Sagittaria*, and Scratch-weed (Fig. 55).

13. *Réniform*, kidney-shaped, broad, rounded at the apex and hollowed at base ; as in *Asarum* or wild-ginger (Fig. 56).

172. *Can you now describe four forms which result chiefly from a deficiency of tissue between the veinlets ?*



56-60, Figures of feather-veined leaves, the remainder of radiate-veined.

14. *Runcinate*, lion-toothed, having the margin divided into large tooth-like segments which point backward, as in Dandelion (Figs. 57, 65).

15. *Lyrate*, with several deep, rounded sinuses or hollows in the tissue between the lower veinlets, as in Winter Cress (Fig. 58).

16. *Pinnátifid*, or feather-cleft, with deep sinuses between the

veinlets, dividing each side of the leaf into oblong segments; as, Pepper-grass (Fig. 59).

17. *Sinuate*, having deep, rounded openings between the veinlets, as seen in the leaves of White Oak (Fig. 60).

173. *Will you now describe some of the forms which radiate-veined leaves assume, commencing with the*

18. *Palmate*?—Hand-shaped, having five veins with as many lobes separated by deep divisions, so as to resemble the palm of the hand with the fingers extended. Ex. Passion-flower (Fig. 61).

19. *Lobate or lobed*?—When the divisions between the veins are shallow, the leaf is said to be merely three-lobed, five-lobed, &c. Ex. Maple (Fig. 41).

20. *Digitate*?—Finger-shaped, having narrow segments very deeply divided; as in the Hemp (Fig. 62).

21. *Pedate*?—Foot-shaped; the same as the palmate, except that the two lateral lobes are themselves subdivided; as in the Pæony.

22. *Laciniate*?—Gashed; the veins and veinlets separated, as if the blade were cut and gashed with scissors. Ex. Butter-cups (Figs. 63, 66).

23. *Peltate*?—Shield-form; the veins radiating from some point in the *midst* of the blade, where also the petiole is inserted. Ex. *Tropæolum* (64).

174. *What other forms already described may also result from radiate venation?*—Reniform, broad-ovate, broad-ovate, &c.

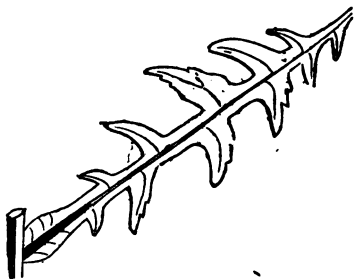


Fig. 65, Leaf of *Lactuca elongata*, or Wild Lettuce.



66, Leaf of Monk's Hood.

175. *Parallel-veined leaves are less diversified in form than the preceding classes ; will you enumerate some of them, as the*

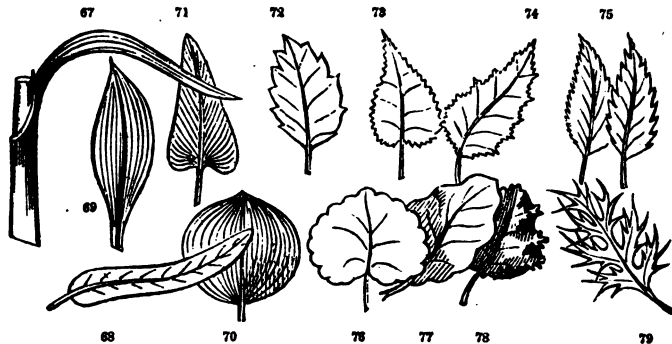
176. *Linear?*—When the veins and fibres are straight, forming a very narrow leaf, as grass leaves generally. This form also occurs in feather-veined leaves, when the veinlets are all very short, as in the Snap-dragon (Figs. 67 and 68).

177. *When will a parallel-veined leaf become oval, or lanceolate, or oblong, or some such form?*—When the veins are curved, Ex. the Orchis (Figs. 69, 70).

178. *When Cordate?*—When the lower veins are curved backward and then upward, as in Pickerel-weed ; and *sagittate* when the lower veins are directed downward, as in Sagittaria.

179. *Acerose?*—Needle-shaped ; when there is little or no distinction of blade, petiole or veins ; as in the Pine.

§ 5. MARGIN.



68, a feather-veined leaf ; 67, 69, 70, 71, parallel-veined ; 72–79, margins of leaves.

180. The margin of the leaf affords also many excellent characters for distinguishing plants. *What form of margin is said to be*

181. *Entire?*—The even-edged ; owing either to the full growth of tissue between the veinlets, as in the Lilac, or owing to a vein

running along close to the margin; as in the Myrtle, Lily, &c., (Figs. 44, 56, 71, &c.).

182. *Dentate*?—Toothed; the tissue incomplete, having teeth with concave edges, pointing outward from the centre, as in the *Circæa*, Hawkweed (Fig. 72). If the teeth are very fine, the margin is called *denticulate* (Fig. 73). If the teeth themselves are toothed, it is *doubly-dentate* (Fig. 74).

183. *Serrate*?—Having sharp teeth pointing forward, like saw-teeth; as in the Rose. If the teeth are very small, the leaf is *serulate*. If the teeth are themselves toothed, it is *doubly-serrate* (Fig. 75).

184. *Crenate*?—Notched with rounded or convex teeth, as in the Ground Ivy. If such notches are very small, it is *crenulate* (Fig. 76).

185. *Erose*?—Gnawed; having the margin irregularly toothed or jagged, as if bitten by animals.

186. *Undulate*?—Wavy; the margin alternately convex and concave, like waves, as in the *Amaranthis* (Fig. 77). -

187. *Spinous*?—When the veins and veinlets project beyond the tissue in sharp spines, as in the Thistle. Such leaves are said to be *armed*, and the opposite term is *unarmed* (Fig. 79).

188. *Incised*?—Cut; the margin cleft or divided as if cut with scissors.

189. *Lacinate*?—Torn; the margin divided by deep, irregular gashes.

190. *Crisped*?—The margin much expanded and curled by an excess of tissue; as in the Crisped Mallow, Cabbage (Fig. 78).

191. *Repand*?—Having the margin slightly concave between the projecting veinlets, like the edges of an umbrella.

§ 6. APEX.

192. *In regard to the termination of the leaf at the apex, when is it said to be acute*?—When it ends with an angle, as in Checker-berry.

193. *Obtuse*?—When it ends with a rounded point, as in St. John's-wort.

194. *Acuminate*?—When it ends with a long, tapering point, as in Birch.

195. *Emarginate*?—Having a notch at the end, as in White Clover.

196. *Mucronate*?—Abruptly ending in a short, hard, bristly point, as in Sweet Clover.

§ 7. SURFACE.

197. There are many useful terms in botany, relating to the qualities of the surface (or epidermis, § 9) of the leaf, which are, however, equally applicable to the stem and all other organs. *Will you define the term Glabrous*?—It means smooth, denoting the absence of all hairs or bristles, as in Hydrangea. Those plants which live in moist or wet soils are mostly glabrous.

198. *Pubescent*?—Covered with soft, downy hairs, as in the Fly-honeysuckle.

199. *Scabrous*?—Rough with hard, short, even points, as in Borrage.

200. *Pilose*?—With short, weak, thin hairs, as in Blue-curls.

201. *Hoary*?—White with very short, dense hairs, as in Life-everlasting.

202. *Villose*?—Clothed with long, thin, shaggy hairs, as in *Solidago altissima*.

203. *Woolly*?—With long, dense, matted hairs, as in Mullein.

204. *Tomentose*?—With dense, short and woolly hairs, as in Hardhack.

205. *Rugose*?—Wrinkled; the tissue between the netted veins convex and concave, from its excess, as in Sage.

§ 8. COMPOUND LEAVES.

206. *Please repeat, once more, the definition of a compound leaf* (See § 154).

207. *And what do you call the divisions of a compound leaf*?—LEAF-LETS; and the same distinctions of outline, margin, &c., occur in them as in simple leaves.

208. *Let us now hear you describe those forms of the compound leaf which result from the feather-veined arrangement, beginning with the*

209. *Pinnate.*—Winged; where the midvein (that is, the petiole) bears a row of leaflets on each side, generally opposite and equal in number, as in Locust-tree, Cassia (Fig. 80).

210. *Mention some varieties of the pinnate leaf.*—It is *unequally pinnate* where it ends with a single leaflet, as in the Rose (Fig. 81); *equally pinnate* where it ends with a pair of leaflets, as in Cassia (Fig. 80); and *cirrrose* when it ends with a tendril, as in the Pea (Fig. 82).

211. *What of the number of the leaflets?*—A pinnate leaf sometimes consists of as many as 20 or 30 pairs of leaflets, as in the Milk-vetch, and Cassia; while in the bean and many other plants there are but 3, and we call such leaves *trifoliate*, or *ternate*.

212. *Can you point out an important distinction in trifoliate leaves?*—Yes. Where the lateral leaflets are attached to the petiole a distance below the end, as in the garden beans, or the Desmodia (Fig. 83), it is *pinnately-trifoliate*; and where the three leaflets are all nearly or quite sessile, as in the Clover or Baptisia (Fig. 84), it is *palmately trifoliate*.

213. *Describe the Bipinnate leaf.*—Twice pinnate; formed where each leaflet of a pinnate leaf becomes itself pinnate, as in Shield Fern, Fumitory.

214. *A Tripinnate leaf.*—Thrice pinnate; formed when the leaflets of a bipinnate leaf become again pinnate, as in the Poison Hemlock (Fig. 86).

215. *What remarkable feature do we observe in the Honey Locust and in the Coffee tree?*—We frequently find leaves on these trees with

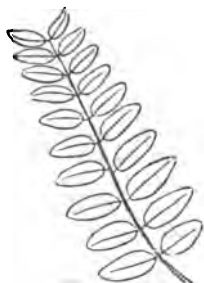


Fig. 80, Cassia.



Fig. 81, Rose.

all these three degrees of division, namely, pinnate, bipinnate and tripinnate, curiously combined; showing the gradual change from the simple to the most compound leaf (Fig. 85).

216. *Are there similar divisions in ternate leaves?*—There are. Where the leaflets of a ternate leaf become themselves ternate, they form a *biterminate* leaf of 9 leaflets, and where these leaflets become again ternate we have a *triterminate* leaf of 27 leaflets. Both kinds are seen in the Baneberry (*Actea*).

217. *Can any of the forms above mentioned result from radiate venation?*—Yes, the palmately trifoliate (Clover).

218. *Describe other forms peculiar to radiate venation; and first the Quinate.*—This form consists of five leaflets, all attached to the summit of the petiole, as in Cinquefoil.



Fig. 82, Pea.



Fig. 83, Desmodium.



Fig. 84, Baptisia leucantha.

When there are seven such leaflets, the leaf is called *septinate*; nine, *nine-foliate*; as in Lupine (Fig. 87), and Horse-chestnut.

219. We will now notice such terms as have regard to the insertion of the leaf. *What is the Amplexicaul leaf?*—A leaf whose base at its insertion, embraces or surrounds the stem (Fig. 88).

220. *The Perfoliate leaf?*

—It has the base lobes completely united around the stem, so that the stem seems to pass *through* the lamina, as in the perfoliate Bellwort (Fig. 89). The *connate-perfoliate* is where two opposite leaves are thus united at their bases around the stem, as in Bone-set (Fig. 90).

221. *The Decurrent leaf?*—

It has its base lobes growing to the stem below the point of insertion, so that the leaf seems to *run downward*, as in the Mullein (Fig. 91). The *stellate* are the same as *whorled* (§ 76).



Fig. 85, Honey locust.



Fig. 86, Poison Hemlock

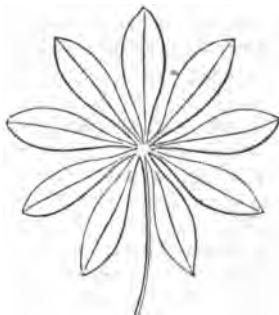


Fig. 87, Lupine.



222. *What is said of double terms?*—It is often found necessary, in the description of a plant, to combine two or more of the terms above described, to express some *intermediate* form or quality; as *ovate-lanceolate*, signifying *between* ovate and lanceolate, &c.

223. *How is the Latin word SUB (under) used?*—It is prefixed to a term to denote the quality in a *lower degree*; as *subserrate*, somewhat serrate; *subsessile* nearly sessile.

LESSON VII.

STIPULES AND BRACTS.

224. *What are stipules?*—Certain leaf-like expansions situated on each side of the petiole at its base. They are sometimes mere scales or membranes, falling off as soon as the leaf expands; but we shall regard those only as true stipules which remain awhile and become green.

225. *Point out some varieties.*—In the Rose (Fig. 81, s) the stipules are *adnate* to the petiole; in the Cotton and Apple they are *free*; in the Pea they are very large (Fig. 82, s), seeming to surround the stem; in the garden Violet (Fig. 92 s) they are much cleft; in the Knot-grass, Buck-wheat, they form a sheath around the stem above the leaf-stalk, called *ochrea*.

226. *Explain the terms derived from stipules?*—Plants which are furnished with true stipules are called *stipulate*, while those which have none are *exstipulate*.

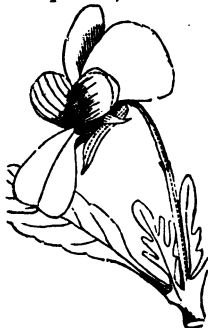


Fig. 92. *Viola tricolor*.

227. *What are Bracts?*—Those half-formed leaves which are often seen upon the flower stalks and near the flowers. They are sometimes colored like the flowers, as in Painted-cup, and Balm. They have received various names, according to their situation and arrangement.

228. *When do they constitute an Involucre?*—When they are arranged in a whorl, and surround a cluster of flowers or flower-stalks. In the Cornel the involucre is white, like a corolla. In the umbelliferous plants there is commonly an involucre; as, Carrot, Poison Hemlock (Conium). Fig. 93, a.



Fig. 93.

229. *What have you learned concerning the involucre of the Asterworts?*—Taking, for an example, the Dandelion or the Sunflower, I find many bracts growing closely around each head of flowers, forming an involucre which appears like a calyx (see these heads described in § 253).

230. *What of the bracts in the grasses?*—In the grasses I find numerous bracts, which are here called husks or chaff, but more properly, *glumes*. To these glumes (in the Wheat, for example) long awns or beard is attached.

231. *Do you think that glumes are transformed leaves?*—Undoubtedly. The sheath of the leaf corresponds to the glume, and the blade to the awn.

§ 1. DURATION.

232. *State the distinctions of leaves, stipules, &c., in respect to duration.*—Such as are *fugacious*, fall early, before the end of summer: the *deciduous* endure through the season, and fall off in autumn: the persistent or *evergreen* remain through all seasons, retaining their color, until the new leaves of the following spring appear, so that the plant is always verdant. On account of these differences, plants are classed as *deciduous* and *evergreen*.

LESSON VIII.

INFLORESCENCE.

233. *Can you tell me what parts of the plant we have hitherto considered?*—Those parts only which serve for the nourishment and support of the plant itself, namely, the root, stem and leaves.

234. *What are the parts next to be considered?*—Those parts which serve the purpose of continuing and multiplying the species after the individual has perished, namely, the flower and fruit.

235. *What have you learned as to the origin of the flowers?*—At a certain season, varying in different plants, some of the buds which might have been formed into leafy branches, are transformed into flowers, in the fulfilment of the Divine command in Genesis, 1st chap. 11th verse: "And God said, Let the earth bring forth grass, the herb yielding seed *after its kind*, and the fruit-tree yielding fruit, whose seed is in itself."

236. *What is the meaning of the term Inflorescence?*—It denotes the arrangement of the flowers upon a stem or branch.

237. *What is said of the position of the flowers upon the stem?*—Since we regard the flower-bud as only a transformed leaf-bud, its position, like that of the leaf-bud, must always be either terminal or axillary.

238. *Will you define the terms Terminal and Axillary?* (§ 66, 67.)

239. *Is there no other position of the inflorescence?*—In a few plants, as in the potato tribe, it is situated *above* the axils and nearly opposite the leaves, that is, it is *supra-axillary*.

240. *What is the Péduncle?*—It is that part of the stem on which the flowers are immediately situated. When the peduncle is wanting, the flower is said to be *sessile*.

241. *Will you give an account of the Pedicels?*—The peduncle may be either *simple* or *branched*. If it be simple, it bears only one flower; but when it is divided into branches, it bears several flowers, and its final divisions, each bearing a single flower, are called *PÉDICELS*.

242. *Will you define a Scape?*—The scape is a flower-stalk which springs from a subterranean stem (§ 56) in such plants as are said to be acaulescent (§ 81). Ex. Dandelion, Tulip, Hyacinth. The scape may also be either simple as in the Daffodil, or branched as in the American Cowslip.

243. *Define solitary inflorescence.*—It consists of a single, terminal flower, as in the Tulip; or it is so called when but a single axillary flower is produced at the same node (§ 71); as in the Morning-glory and Petunia.

244. *You may now define the various modes of inflorescence, in the order in which I shall mention them; and first, the Spike.*—This form of inflorescence consists of several sessile flowers arranged along a common peduncle (or rachis); as in the Mullein and Plantain and some grasses (Fig. 105).

245. *What do you understand by the term Rachis?*—It means the main part, or axis of the peduncle, which supports the sessile flowers or pedicels.

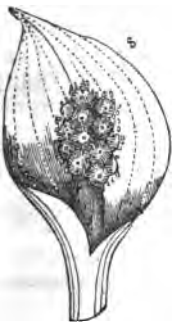


Fig. 94, *Calla palustris*.



Fig. 95, White Birch.



Fig. 96, *Phytolacca*.

246. *The Raceme?*—This is the same as the spike, except that the flowers (or fruit) are raised on pedicels, each in the axil of a bract, and blossoming in succession from the base upward. Ex. *Pyrola*, Hyacinth Currant, Poke (Fig. 96).

Fig. 97, a Thyrsæ.

247. *The Ament, or catkin?*—It is a spike of naked, scaly flowers, which all fall off together, not separating from the rachis; as in the Birches, Willows, Poplars. Such plants are called *amentaceous*. (Fig. 95.)

248. *The Spadix?*—This is also a spike with a fleshy rachis, often enveloped in a large bract (*s*), called *Spâthe*; as in the Indian turnip, and Calla (Fig. 94).

249. *The Corymb?*—This differs from the raceme in having the lower pedicels so lengthened as to elevate all the flowers to nearly or quite the same level, as in many of the *Spiræas* and Thorns. (Fig. 104).

250. *The Umbel?*—Differs from the corymb in having the pedicels all springing from the same point in the common peduncle, and all of about equal lengths, like the stays of an umbrella, as the onion, milkweed, garden cherry. (Fig. 101.)

251. *Difference between a Simple and a Compound umbel?*—The simple umbel is that already described; and a *compound umbel* is such as would be formed were each pedicel of the simple umbel to bear an umbel instead of a single flower; as in Caraway, Fennel. Here we call the little umbels *umbellets*, and their stalks *rays*. (Fig. 93.)

(In the same manner we also explain the *compound corymb*, *compound raceme*, &c.)

252. *The Head or capitulum?*—It is similar to an umbel, but the flowers are sessile, or nearly so, upon the summit of the peduncle, in a dense mass; as, Teazel, Clover, Button-bush, *Eryngium*. (Fig. 100.)

253. *Please describe carefully the Head in the Compositæ.*—In this



Fig. 93.



Fig. 99, Grass.



Fig. 100, Verticill.



Fig. 101, Umbel.

vast family, the *heads* (once called *compound flowers*) bear a general resemblance to single flowers. But when we examine such a head (for example, of an Aster, or Sunflower, or Mayweed), we see that it consists of many little distinct flowers, crowded together upon the broad summit of the peduncle (called the disk or RECEPTACLE.)

254. *Explain the parts of this kind of head.*—What seem to be the petals are the *rays*, and what seems the calyx is the involucre (§ 228). The outer circle of flowers which bear the rays are called the *ray-flowers*, the others the *disk-flowers*.

255. *Distinguish between the radiate, radiant, and discoid heads.*—Where the ray-flowers only are *ligulate* (see § 287), as in Sunflower, the head is *radiate*; where the ray and disk-flowers both are *ligulate*, as in the Dandelion, it is *radiant*; and where none of the flowers are ligulate, as in the Tansey, it is *discoid*.

(a. *What is the meaning of the term Radiant when applied to an umbel, a corymb, or a cyme* (§ 258)?—It implies that the corymb, cyme, &c., is surrounded by a circle of flowers whose petals are larger than the rest, more showy, and usually (but not always) with no stamens or pistils; as in the Candytuft, Coriander, Hydrangea and Viburnum.)

256. *What is a Panicle?*—The panicle is a compound inflorescence, formed by an irregularly branching peduncle, as in the Oats, Asters, Phlox (Fig. 99).

257. *A Thyrsé?*—This is similar to the panicle, except in being more compact and of an egg-shaped form; as, the Lilac, Horsechestnut (Fig. 97).

(All these forms of inflorescence may be classified as *axillary*, since they result from axillary flowers in some form or other. The following forms result from terminal flowers, and may be classed as *terminal*.)

258. *Describe the Cyme.*—This inflorescence has the general appearance of a corymb, but is remarkably distinguished by its branches being repeatedly 2-forked and 3-forked, and by its central flowers blossoming first; as seen in the Elder, Hydrangea, Chick-weed (Fig. 102).

259. *A Fascicle.*—This is a sort of cyme in which the flowers are crowded and nearly sessile; as in the Sweet-William and other Pinks (Fig. 103).



Fig. 102, Cyme.



Fig. 103, Fascicle.



Fig. 104, Corymb.



Fig. 105, Spike.

260. A *Vérticil*.—This term is applied to those reduced cymes which are peculiar to the *Labiatae* (as. Catmint, Motherwort, Hemp-nettle), where two such cymes occupy the opposite axils at each node, and appear to be whorled. (Fig. 100).

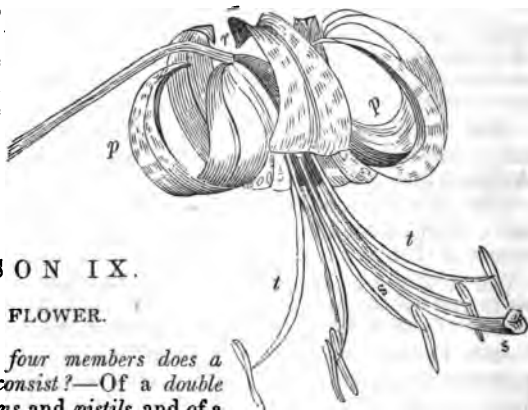


Fig. 106, Tiger Lily.

LESSON IX.

THE FLOWER.

261. Of what four members does a complete Flower consist?—Of a double *périnth*, of *stamens* and *pistils*, and of a *receptacle*.

262. Please point out all these parts in this figure of the *Tiger Lily*, and in the flower which you hold in your hand.—The slender, thread-like organs seen at *t t*, are the *stamens*; in their midst, at *s s*, is the *pistil*. At *p p*, is the double *périnth*, consisting of two circular

rows, and each row of three similar leaves; at *r*, is the receptacle.

263. *Are all these members necessary to constitute a perfect flower?*—They are not. A flower is called *perfect* if it has both stamens and pistils, whether it has a perianth or not; because the stamens and pistils only are necessary to the perfection of the seed. The sign or symbol of a perfect flower is this ♀.

264. *Specify the several kinds of imperfect flowers.*—A flower with stamens and no pistils is a *sterile* (♂) flower. A flower with pistils and no stamens is a *fertile* (♀) flower. A flower with neither stamens nor pistils is a *neutral* flower. Examples of ♀ and neutral flowers are seen in the *Hydrangea*; of ♂ and ♀ in *Sagittaria* and in the *Cucumber* family.

265. *What of the Perianth?*—It is either single or double; that is, it consists of a single circle, or of two or more circles of leaf-like organs, surrounding the stamens. The *outer* circle or whorl is the *CALYX*, and the *inner* (if there be more than one) is the *COROLLA*. A flower, therefore, may have a calyx without a corolla, but it cannot have a corolla without a calyx. If it have neither of them, it is called a *naked* flower.

266. *The Stamens?*—These are those slender, thread-like organs, situated next within the perianth, generally five in number, but varying from one to a hundred or more.

267. *The Pistils?*—These organs occupy the centre of the flower, sometimes numerous, but often only one.

268. *The Receptacle?*—This is merely the summit of the flower-stalk, out of which the floral organs grow, and upon which they stand, the pistils in the centre, the stamens encircling them, the corolla next without and the calyx surrounding the whole.

269. *Point out the parts above-mentioned in this figure of the Pink or in a specimen flower.*—At *a* is the corolla, of five leaves; at *b* is the calyx of five leaves united (except at the top) into a tube, which seems to contain the rest of the flower like a cup; at *d* are certain

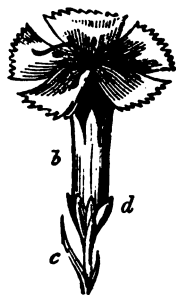


Fig. 107. Pink.

leafy appendages called bractlets; at *c* are two *bracts*; within and above the corolla are seen the ten stamens and the two pistils.

270. (Let the learner continue to point out and designate by name the several parts and organs in flowering specimens, until he becomes familiar with the appearance of each, and can instantly apply their names.)

LESSON X.

THE CALYX.

271. *Will you give a more particular description of the Calyx?*—The word is from the Greek language and signifies a cup. In the flower, it is composed of a whorl of leaves called **SEPALs**, which are either distinct from each other, or grown together by their edges. It is always placed on the outside of the flower, and is generally green, but sometimes colored (that is, of some other color than green).

272. *Define the terms monosepalous and polysepalous.*—The calyx is said to be monosepalous when the sepals are united by their edges into a single *piece* (though never a single *sepal*). It is said to be polysepalous when the sepals are wholly distinct.

273. *The free and the adherent calyx are very important distinctions, and require very careful attention. Can you define them?*

—The calyx generally stands distinctly *below* the seed-vessel (ovary, § 315), not growing or adhering to its sides: it is then said to be *free*, or *inferior* (Fig. 108, 1); as in the Wall-flower and Cherry. But very often it is found adhering to the ovary, so that only the upper part of the sepals rise above it, and seem to

Fig. 108.

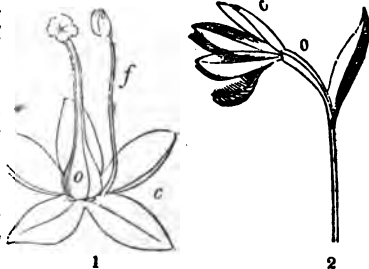


Fig. 108, 1. Calyx (*c*) inferior, ovary (*o*) superior, stamen (*f*) hypogynous.—2, Calyx (*c*) superior, ovary (*o*) inferior.

stand upon it: the calyx is then said to be *adherent*, or *superior*; as in the Apple, Currant, Pogonia (Fig. 108, 2).

274. *Give now the reductions of the calyx.*—The calyx is sometimes, apparently, reduced to a mere rim, as in the Caraway, and sometimes (when there is no corolla, § 265) is entirely wanting.

275. *How is it reduced in the Asters, Lettuce, Thistle, and most of the Composita?*—It is there reduced to a whorl of mere hairs or bristles and called the *pappus* (See Fig. 115). In these cases it seems that the calyx has not room to grow in the usual manner, the flowers being so densely crowded in heads.

LESSON XI.

THE COROLLA.

276. *What description is further given of the corolla?*—COROLLA is a Latin word, signifying a chaplet or crown. It is fitly applied to that whorl of the floral envelopes situated between the calyx and stamens, upon whose delicate texture and colors chiefly depends the beauty of the flower.

277. *What are the petals?*—The divisions of the corolla are called PETALS. Like the sepals of the calyx, they are also either distinct, or united by their adjacent edges to a greater or less extent. If quite distinct in this respect, the corolla is *polypetalous*; if united, however slightly, it is said to be *monopetalous*.

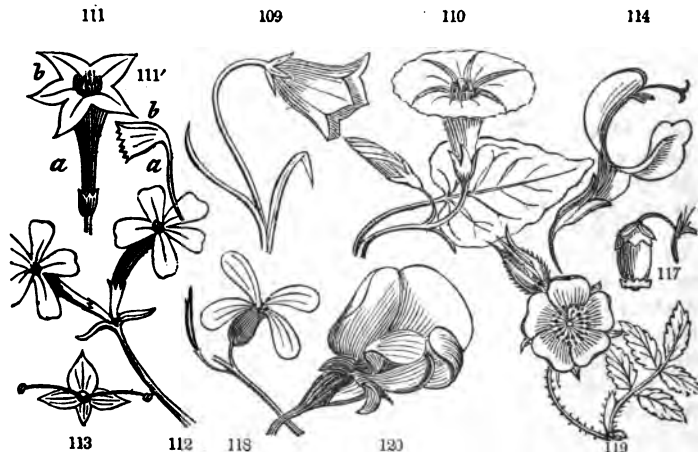
278. *Distinguish the parts of a petal.*—The petal consists of two parts; the *claw* which is the narrow part at the base, answering to the petiole of a leaf (§ 148), and the *lámina* or *border*, which is the expanded portion, supported by the claw, answering to the blade of the leaf. The claw is sometimes very long, as in the Pink, and often entirely wanting, as in the Rose Fig. 111', a, b).

279. *The parts of a monopetalous corolla.*—When the petals are united into a monopetalous corolla, the united claws form that part of it which is called the *tube* and the laminas form the upper.

expanded portion of it, called the *limb*. Both these parts are exemplified in the Phlox and Tobacco (Fig. 111, a, b).

280. *Distinguish the regular and irregular corolla.*—The corolla is *regular*, when its corresponding parts are all alike in form, size, cohesion, &c., and *irregular* when they are not. We quickly perceive that the Rose, Tulip, Mustard have regular flowers, and the Bean, Pea and Lark-spur, irregular.

281. *The monopetalous corollas assume many forms which have received appropriate names. Will you describe in order, first, the Campanulate?*—This is a bell-shaped corolla, having the tube wide above, contracted abruptly at base, as in the Bell-flower and Greek Valerian (Fig. 109).



FORMS OF COROLLAS.—109, Bell-wort; 110, Morning-glory; 111, Tobacco; 112, Phlox; 113, Speedwell; 114, Sage Clarry; 117, Winter-green (urceolate or urn-shaped); 118, Cabbage; 119, Rose; 120, Pea.

282. *Infundibuliform?*—Funnel-form; tubular at base, gradually enlarging toward the border; as, Morning-glory, Tobacco, Ipomæa (Fig. 110).

283. *Hypocratérisform*?—Salver-form; the tube ending abruptly in a flat, spreading border; as, the Phlox (Figs. 111, 112).

284. *Rotate*?—Wheel-form; limb regular or nearly so, spreading, with a very short, or hardly perceptible tube; as in Mullein, Speedwell. (Fig. 113.)

285. *Labiate*?—Lipped; the limb deeply divided into two irregular segments, called the *upper* and *lower lip*. If the lips be widely separated, the corolla is *ringent* (grinning); as, the Monkey-flower: if closed, it is *personate* (masked); as, the Snap-dragon. The upper lip is also often *arched* as in the Henbit.

286. *Tubular*?—Where the corolla is a tube only, scarcely expanding at top into a limb; as, Trumpet Honey-suckle, and the disk flowers of the *Compósitæ* (Fig. 115).

287. *Ligulate*?—Strap-shaped; a corolla tubular at base, with a long, narrow limb, all turned to one side, generally with five points at the end showing the union of the petals. Such are the ray-flowers of the Sunflower, Goldenrod (Fig. 116), and of most of the *Compósitæ*.



115
Florets of Solidago.

288. *Several forms of polypetalous corollas have also received appropriate names, and you may describe them as follows. First, the Cruciform*.—Crossing, or cross-shaped; consisting of four petals spreading at right-angles to each other. Plants with this corolla constitute the large family of the *Cruciferae*, including the Mustard, Rocket, Wall-flower (Fig. 118).

289. *Rosæceous*.—Like the Rose. A regular corolla, consisting of five or more petals spreading horizontally, attached to the receptacle by very short claws; as, the Rose, Apple, Strawberry, and a thousand other plants (Fig. 119).

290. *Liliæceous*.—Like the Lily; this is a regular perianth, consisting of six parts usually in two whorls, each gradually bending outward in such a manner as to resemble the campanulate form; as, the Lily, Tulip (Fig. 105).

291. *Caryophyllæceous*.—Like the Pink; this corolla is also reg-

ular, consisting of five petals having long claws included in the tubular calyx ; as, the Pink, Cockle (*Lychnis*) (Fig. 106).

292. *Papilionaceous*.—Butterfly-shaped ; an irregular corolla, consisting of five dissimilar petals which are named as follows. The upper and largest is called the *banner*, the lateral ones beneath this the *wings*, and the two lower, cohering by their lower margins, the *keel*. Plants with this kind of corolla constitute the greater part of the *Leguminosæ*, one of the largest and most useful of the Natural Orders, (Fig. 120.)

LESSON XII.

OF THE NECTARY AND DISK.

293. *What is said of these terms in general?*—These terms have been applied to certain unusual forms of the floral organs, which are very variable in their form and position.

294. *What is the Nectary?*—The *Nectary* is properly an apparatus for forming and containing honey (or *nectar* in Latin).

295. *Give us some examples and forms of the nectary.*—In the Violet, Larkspur, Columbine, &c., it consists of a lengthening of a petal into a *spur*. In the Indian Cress it is a similar lengthening of a sepal. In the Passion-flower, Gold-thread, Grass of Parnassus, the (so-called) nectaries are merely abortive stamens, changing into petals.

296. *What is said of the so-called nectary of the Ladies' Slipper or Cypripedium, and of other plants of the Orchidaceæ?*—The lower petal being larger and inflated into the form of a sack or pouch, was called a nectary by Linneus, but is now generally called the *lip*.

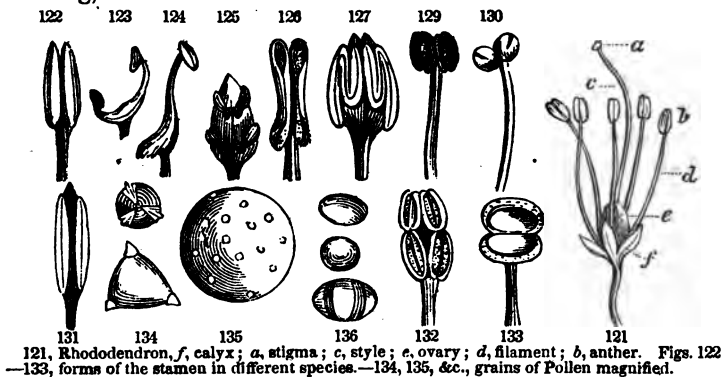
297. *Have you any knowledge of the Disk?*—But little ; it is not found in every flower. It is usually situated between the pistils and stamens, and in the form of a rim surrounding the base of the ovary, as in the *Pæony* ; or it appears at the top of the ovary when the calyx is adherent, as in the *Cornel*.

LESSON XIII.

OF THE STAMENS.

298. *How are we to distinguish the stamens?*—They are the organs situated next within the corolla surrounding the pistils, in the midst of the flower, and usually of a slender, thread-like form.

299. *What are the parts?*—The *filament*, *d* (Fig. 121), the *anther*, *b*, containing the *pollen* in its cells. The filament is sometimes wanting, and then the anther is *sessile*.



300. *The Filament?*—It comes from the Latin word *filum*, a thread, and denotes the slender stem which supports the anther at or near its top. It is analogous to the petiole of a leaf, or the claw of a petal. When it is wanting the anther is *sessile*.

301. *The Anther?*—It is commonly placed at the top of the filament, and attached to it in various ways. It is composed of two lobes or cells which generally open lengthwise by lateral fissures, but sometimes by terminal pores; as in the Potato and Blueberry.

302. *The Pollen?*—This is, in appearance, little yellow grains contained in the cells of the anther. When seen through a microscope

the grains appear of some regular figure, as globular, or oblong, or angular, &c. (Figs. 134, 135, 136, &c.)

303. *What is the office of the Stamens?*—The office and use of the stamens is to *quicken* the young seeds (ovules, § 324), by conveying the pollen to the stigma—without which there can be no fruit matured.

§ 1. THE LINNÆAN CLASSES.

304. *In what respects do the stamens vary in different species of plants?*—In their number, position, relative length, connection and presence; and upon these five different conditions of the stamens the twenty-four Linnæan Classes are founded.

305. *Who was Linnæus?*—The most eminent of naturalists, native of Sweden, from 1707 to 1778, the inventor of that system of classification in botany which bears his name.

306. *Is this system of classification still in use?*—Not generally. But still we ought to acquaint ourselves with the definitions of the twenty-four classes on account of the use made of their names in descriptive botany.

307. *Well, then, will you state upon what condition of the stamens the first eleven classes are founded?*—Upon their *number*, they being of equal length and disconnected with each other.

308. *Please define these eleven classes in order.*—

1. *Monándria*.—One stamen. Includes all plants which have but one stamen to the flower.

2. *Diándria*.—Plants with two stamens to each flower.

3. *Triándria*.—Plants with three stamens to each flower.

4. *Tetrándria*.—Plants with four stamens to each flower.

5. *Pentándria*.—Plants with five stamens to each flower.

6. *Hexándria*.—Plants with six stamens to each flower.

7. *Heptándria*.—Plants with seven stamens to each flower.

8. *Octándria*.—Plants with eight stamens to each flower.

9. *Enneándria*.—Plants with nine stamens to each flower.

10. *Decándria*.—Plants with ten stamens to each flower.

11. *Dodecándria*.—Plants with eleven to nineteen stamens, &c.

309. *The second condition with its two classes?*—The next two

classes are founded upon the *position* of the stamens, their number being twenty or more, and their filaments distinct; namely,

12. *Icosándria*, stamens indefinite in number, situated on the calyx (that is, *perígynous*).

13. *Polyándria*, stamens indefinite in number, situated on the receptacle (that is, *hypógynous*; Fig. 107).

310. *The third condition with its classes?*—The next two classes are founded upon the *relative length* of their stamens, together with their number; namely,

14. *Didynâmia*, with four stamens, two longer than the other two.

15. *Tetradynâmia*, with six stamens, four longer than the other two;

311. *The fourth condition with its classes?*—The next five classes depend upon the *connection* of the stamens in various ways;

16. *Monadélphia*, the filaments united into one set.

17. *Diadélphia*, the filaments united into two sets.

18. *Polyadélphia*, the filaments united into several sets.

19. *Syngênêsia*, the anthers united into a tube: flowers in heads, and

20. *Gynándria*, stamens consolidated with the pistil.

312. *The fifth condition with its classes?*—The four remaining classes depend upon the *absence* of the stamens in a part or all of the flowers of the same species; they are

21. *Monœcia*, stamens and pistils in separate flowers on the same individual plant (symbol, ♂).

22. *Diaœcia*, stamens and pistils in separate flowers on different individuals of the same species (symbol, ♂ ♀).

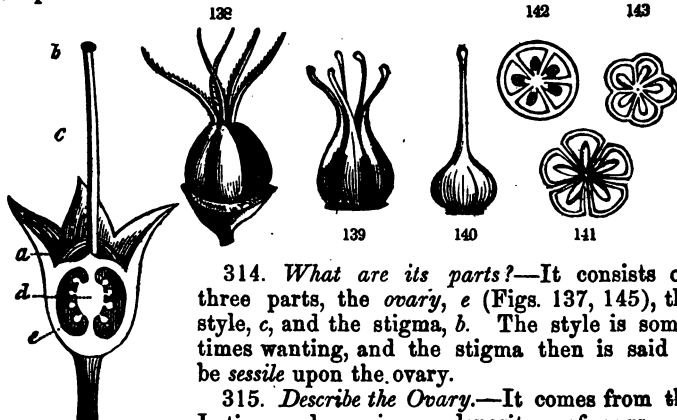
23. *Polygâmia*, flowers perfect, sterile and fertile, either on the same, or on different plants of the same species (symbol, ♂ ♀ ♀).

24. *Cryptogâmia*, stamens and pistils wanting. Plants flowerless.

LESSON XIV.

OF THE PISTILS.

313. *What is the position of the Pistil?*—The pistil or pistils occupies the centre of the flower at the extremity of the axis.

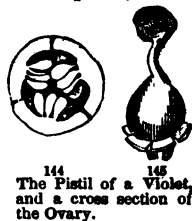


137, Whortleberry.

314. *What are its parts?*—It consists of three parts, the *ovary*, *e* (Figs. 137, 145), the style, *c*, and the stigma, *b*. The style is sometimes wanting, and the stigma then is said to be *sessile* upon the ovary.

315. *Describe the Ovary.*—It comes from the Latin word *ovarium*, a depository of eggs. It is the tumid and hollow part of the pistil, situated at its base, containing the *ovules*, or young seeds, within its cavities, and destined to become the fruit.

316. *I wish you now, if you are able, to describe the Carpels.*—The ovary is either *simple* or *compound*. When compound it consists of two or more lobes or divisions, called *CARPELS* (from the Greek word, *karpós*, fruit), united together more or less closely.



144
The Pistil of a Violet,
and a cross section of
the Ovary.

317. *It is often very important to distinguish the number of the carpels ; but how can it be done ?*—We can generally perceive the carpels by the outward lobes of the ovary ; or they may often be known by the number of the stigma lobes, where the styles are united (See the 5-lobed stigma, s, Fig. 107).

318. *Please show by the figures (138, 139, 140, 141, 142, 143) how the carpels are united in different degrees.*

319. *Define the Style.*—The style is that prolonged, columnar part of the ovary, or rather of each carpel, which bears the stigma at the top. The number of styles (where there are any) is always equal to the number of carpels.

320. *How can this be, since the compound ovary has often, apparently, but one style ?*—Sometimes, when the carpels are united into one ovary, the styles are also united in one compound column ; or they may even then be distinct.

321. *Illustrate this by the figures, or by specimens (Figs. 137—145).*

322. *Now let me hear you describe the Stigma.*—This is the upper portion or extremity of the style, extremely variable in form, but generally disk-like or globular. Like the ovary and style, it is either simple or compound. When it is compound, it consists of as many lobes as there are carpels.

§ 1. OF THE LINNÆAN ORDERS.

323. *What use did Linnæus make of the Number of the styles ?*—He made it the basis of the artificial orders of his first thirteen classes, as follows :—

1. *Monogýnia*, with one style to each flower—simple or compound.
2. *Digýnia*, with two styles.
3. *Trigýnia*, with three styles.
4. *Tetragýnia*, with four styles.
5. *Pentegýnia*, with five styles.
6. *Hexagýnia*, with six styles.
7. *Heptagýnia*, with seven styles.
8. *Octogýnia*, with eight styles.
9. *Enneagýnia*, with nine styles.
10. *Decagýnia*, with ten styles.
11. *Dodecagýnia*, with twelve styles.
12. *Polygýnia*, with many styles.

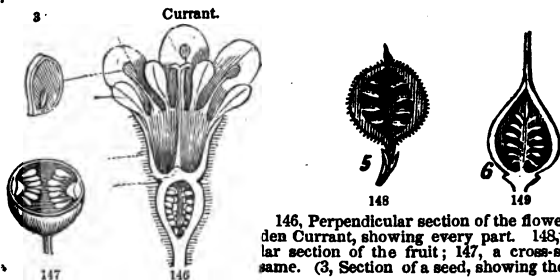
§ 2. OF THE OVARY AND OVULES.

324. *What are the Ovules ?*—These are certain little globular

bodies produced in the cells of the ovary, destined to become the seeds.

325. *Explain the figures, 137, 146.*

326. *What is the Placenta?*—It is that part of the ovary from which the ovules arise, or grow, and to which they are attached. It consists of a line or fleshy ridge, placed in some corner of the cell, always parallel with the axis of the flower, that is, extending *up and down*.



146, Perpendicular section of the flower of the Garden Currant, showing every part. 148, Perpendicular section of the fruit; 147, a cross-section of the same. (3, Section of a seed, showing the embryo.)

327. *The positions of the Placentæ?*—The placentæ are *parietal* when they grow upon the sides or wall of the ovary, as in the Currant (146, 147, 148)—*central* when growing in the axis, and *free central* when in the centre or axis without having any connection with the sides; as in the Pink and Primrose (149).

328. *The free and adherent ovary are very important distinctions. Can you distinguish them?*—The ovary is said to be *adherent* or *inferior*, when its sides grow to the calyx, so that the sepals seem to stand upon the ovary; but when the ovary does not adhere to the calyx, it is said to be *free* or *superior* (§ 273, Figs. 107, 108, o).

329. *Illustrate these things by explaining the figures.*

330. *Illustrate them by examples.*—In this Larkspur, or Violet, or Cherry blossom, the ovary is seen *within* the calyx *above* its base, and therefore is *free*, or *superior* to the calyx, which is *inferior*. In the Snow-berry, the Apple, and the Elder, the ovary appears *below* the calyx in consequence of growing to it within, and is therefore *adherent*, or *inferior*, while the calyx is *superior*.

331. *What is meant by half free or half superior?*—Having only the lower half of the ovary adhering to the calyx, as in the False Syringa (Philadelphus).

332. *What is the office and use of the Pistil?*—It protects and nourishes the young seeds or ovules. The stigma catches some of the pollen as it falls from the anthers, and conveys through its soft, porous substance, the quickening matter to the ovules contained in the cells of the ovary.

LESSON XV.

ARRANGEMENT OR PLAN OF THE FLOWER.

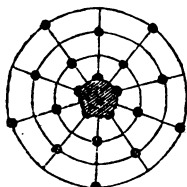


Fig. 150.

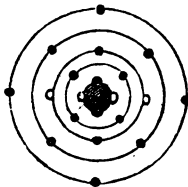


Fig. 151.



Fig. 152.

PLANS OF FLOWERS.—150, of *Sedum ternatum* and other regular and symmetrical flowers. The outer circle shows the place of the 5 sepals; the next circle, the 5 petals; the next, the 5 stamens; then the 5 pistils.—151, plan of a cruciform flower, as of the Mustard, with 4 sepals, 4 petals, 2 stamens (and 2 wanting) in the third circle, 4 stamens in the fourth circle, 2 carpels (2 wanting) in the fifth circle.—152, plan of the flower of Speedwell. *a*, the 4 sepals; *b*, the 4 petals (unequal); *c*, the 2 stamens; *d*, the 2 carpels.—*Is it symmetrical, or not?*

333. *If you have attentively examined the structure of many flowers, you have probably noticed that there is a manifest tendency in them all towards one general plan of arrangement, &c., however diversified in size, color, number, and form they may be. Can you state some instances of these tendencies?*

1st, A tendency to consist of four different sets of organs, in four or five whorls.

2nd, To contain the same number of distinct and equal organs in each whorl.

3rd, To have the organs of each whorl stand alternate with those of the adjacent whorls.

334. *Are there many flowers which conform to this plan in all respects?*—There are but few, since in almost every plant the flowers deviate from it in some way peculiar to itself.

335. *Can you mention any examples at all of such a flower?*

—Yes; all the species of the Houseleek family are of this sort; thus, the flowers of *Sedum ternatum* and *Sedum acre* (153) have each five whorls of organs, with five or four in each whorl.

Sempervivum tectorum (154) has four whorls, each with 10 or 12 organs. *Tillæa* has four whorls, with 3 organs in each whorl. These flowers are both *regular* and *symmetrical*.



Fig. 153.

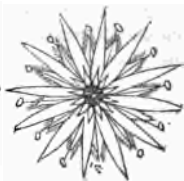


Fig. 154.

336. *What do you understand by a symmetrical flower?*—It is one in which there is the same number of organs in each of the whorls. Thus the *Trillium* has 3 sepals, 3 petals, 6 stamens in 2 whorls of 3 in each, and 3 carpels.

337. *A regular flower?*—It is one in which all the organs of the same whorl correspond with each other in form, size and connection; as, the Tulip, Rose (single), Columbine, Mallows.

338. *An irregular flower?*—One in which the parts of the same whorl are not alike. In the Violet, the petals are dissimilar. In the Bean family, the petals and stamens differ. In the Labiatae, also, the petals, stamens and sepals are, respectively, dissimilar.

339. *Give examples of unsymmetrical flowers.*—The flowers of the Mustard and all other cruciferous plants are unsymmetrical, having 4 sepals, 4 petals, with 6 stamens and 2 carpels. The Poppy family, also, has flowers with 2 sepals, 4 petals, and an indefinite number of stamens and carpels.

340. *Are all irregular flowers unsymmetrical also?*—They are not. For example, nothing can be more irregular than the Ladies'-slipper; yet we can find in it 3 sepals, 3 petals, 3 stamens, and 3 car-

pels, although some of these organs are much disguised. There are many such examples.

341. *Will you examine the flower of the Monk's-hood, and tell me how many sepals, how many petals, &c., it has?—also, the Snake-head? and the Beard-tongue? and the Fleur-de-luce (and many others)?*

342. *Will you tell me now about double flowers—what are they?—*We call a flower *double* when the petals become twice or several times as many as usual, as in the Rose and Pæony. This effect is almost always owing to cultivation.

343. *Can you explain this subject a little farther?—*It is too great a subject to be fully explained in this book; but one thing I have noticed: that when, in the Rose, &c., the petals *increase* in number, the *stamens diminish*. I suppose, therefore, that the stamens are transformed to petals. (See this subject more fully illustrated in the Class-Book of Botany, pp. 30–33.)

LESSON XVI.

OF ÆSTIVATION.

344. *I suppose this is a word which you have not often met with. Can you recite its meaning?—*It is formed from the Latin word *æstivus*, the summer, and is used by botanists to denote the manner in which the several leaves of the flower are folded up in the bud.



155

156

157

158

345. *How can we best observe the æstivation of a flower bud?—*By a cross-section, that is, by cutting the bud square across in

its midst, with a keen knife. In this way we see many varieties of arrangement; of which only a few are here described. (See Class-Book of Botany, pp. 50 & 83.)

346. *What is the Valvate Æstivation, and an example?—*It is

where the petals or sepals, &c., meet each other by their edges only ; as, the petals of Umbelworts, or the Lilac, or the valves of a capsule (155).

347. *The Convolute?*—The rolled æstivation ; when one is wholly rolled up in another ; as, the petals of the Wall-flower (156) (157, rose-bud).

348. *The Contorted?*—The twisted æstivation ; when each piece overlaps its neighbor in the same direction, that is, all towards the right or the left. Such buds appear twisted ; as, the Phlox, Olean-der, Dog's-bane (158).

349. *The Imbricated?*—The shingled ; a general term, denoting that the pieces overlay each other, edge upon edge, in either of the above-mentioned ways, like shingles on a roof.

350. *Does the term Æstivation apply to the leaf-bud as well as the flower-bud?*—It does not. *Vernation* is the word which applies to the leaf-bud.

351. *Define this word.*—It is formed from the Latin word *vernus*, the spring, and denotes the folding of the young leaves in the leaf-bud.

352. *Define the E'quitant vernation.*—It is where the leaves overlay each other without being rolled ; as in the Iris.

353. *The Plaited and the Circinate?*—Plaited, when the leaf is folded like a fan, as in the Birch, Palm ; and *circinate* when rolled downward from the apex, as in the Sundew, Fern.

LESSON XVII.

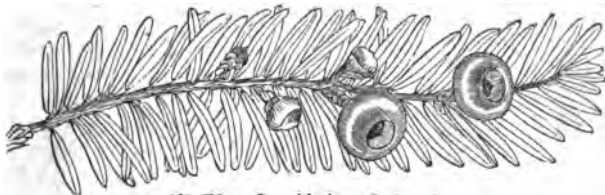
THE FRUIT.

354. *Repeat the definition here given.*—The *fruit* is the matured pistil, or, the ovary brought to perfection.

355. *What is said of its value and importance?*—It is regarded as the most important part of the plant, not only serving to perpetuate vegetable life, but affording one of the principal means of sustenance to animals and to man.

356. *What of its colors?*—Although, in general, its beauty is far inferior to that of the flowers, yet sometimes its color is more brilliant than that of the blossom which produced it.

357. *Of what does the fruit consist?*—Of the *pericarp* and the *seed*. Sometimes of the *seed* only, there being no *pericarp*.



161, *Taxus Canadensis*—naked seeds.

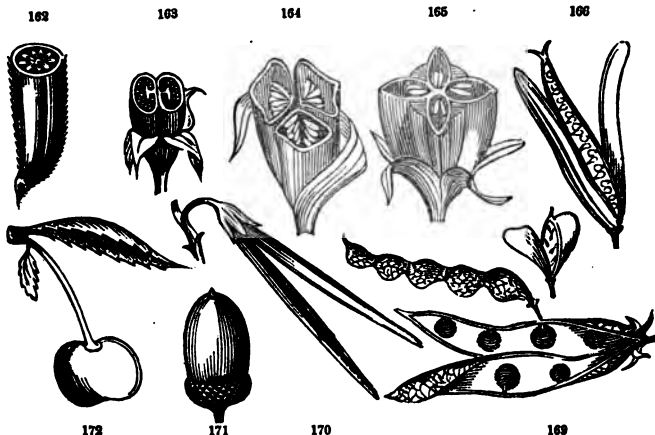
358. *What can you say concerning naked seeds?*—Certain kinds of fruit resemble naked seeds; as, the Butter-cups, Sage, Maize and Wheat. But the presence of the *pistil* or the *stigma* in these flowers proves that there was also an *ovary*, and consequently a *pericarp*. But in the Fir family, as Pines, Spruces, Cedars, &c., there is no *pistil* or *stigma* in the flowers, and the seeds are truly naked (Fig. 161, *a*, *b*).

359. *What is the Pericarp?*—It is the covering or envelope of the seeds, of whatever nature it may be. It generally consists of three coats, whose peculiarities may be readily seen in the Peach, Apple, and Cherry, but are very obscure in many fruits. First is the *cuticle* or *epidermis* outside; 2d, the *flesh-coat*, or *pulp*; and 3d, the *shell-coat*, within, next the seed. (For a more particular description of these coats, and also concerning the ripening of fruits, see *Class-Book of Botany*, p. 52.)

360. *What constitutes the eatable part of fruits?*—This is extremely various. In the Apple, Quince, &c., it is the *calyx* cohering with the *ovary*, which becomes the fleshy, eatable part. In the Strawberry, it is the *receptacle*. In the Checker-berry, the *calyx* becomes fleshy and eatable without adhering to the *ovary*. In most plants, however, the nutritious matter is laid up in the seeds, while the *carpel* ripens into a *dry fruit*.

§1. FORMS OF THE FRUIT.

361. *These are very numerous, but the following, only, are of much service in the distinction of orders and genera. Please define a Follicle.*—This is a dry fruit or pod formed of a single carpel, and opening when ripe by a single seam, which is on the front side and called the *ventral suture*. Ex. Columbine, Larkspur, Silk-grass.



Forms of Fruit.

362. *A Legume.*—This is also a sort of pod, consisting of a single carpel, opening by two valves and two seams, but having the seeds attached to the ventral suture only. The Pea, and all other plants of the great order Leguminosæ, are examples. (Figs. 168, 169.)

363. *A Silique.*—A sort of pod, formed of two carpels, with two cells, and opening by two valves. The seeds are attached alternately to the two edges of the thin membrane which separates the two cells. The fruit of the Mustard family (Crucifers) are either siliques or *silicles*. Fig. 166.)

364. *A Silicle*—how does it differ from a *Silique*?—Only in form. The *Silique* is long and narrow, as in the Mustard; but the *Silicle*

is short and oval or ovate in form, as in the Shepherd's-purse, Pepper-grass. (Fig. 167.)

365. *How do you explain the Membrane which separates the cells in these fruits?*—Since the seeds are attached to its two edges, I suppose that it consists, in fact, of the two *placenta*, which here separate from the valves.

366. *The Capsule?*—This word signifies a casket, and is applied to those compound fruits which are dry and woody in texture, consisting of several united carpels.

367. *What is said concerning the opening of Capsules?*—While there are many kinds of fruits which never open (as the Apple), the capsule opens, when ripe, at the sides or the top, by valves or by pores.

368. *Will you mention the botanical terms used in these cases?*—The opening of the fruit is called its *dehiscence*. If it do not open at all, it is called *indehiscent*.

369. *Mention some of the varieties of the Capsule.*—The capsule, although it is a compound fruit, often contains but a single cell (§ 320), as in the Pinks and Primroses; or it is divided within, by partitions, into several cells (Fig. 162, one-celled; 163, two-celled; 164, three-celled; 165, four-celled).

370. *What name is given by botanists to these partitions?*—DISSÉPIMENTS.

371. *What of the number of the cells?*—A two-carpeled capsule may have two cells, as in the Mullein, Speedwell: a three-carpeled capsule may have three cells, as in the Lily, Iris, Orchis: a four-carpeled capsule four cells, as in Evening-primrose: a five-carpeled, five cells, as in Rhododendron, &c. Rarely there are twice as many cells as carpels, as in the Flax. (Figs. 162, 163, 164, 165.)

372. *Describe the Drupe.*—It is a stone fruit, (like the Cherry, Peach,) indehiscent, one-carpeled, (rarely two-carpeled,) having a hard shell-coat within and a soft flesh-coat without (Fig. 172).

373. *Where do you class such fruits as the Butternut and Walnut?*—Among drupes; or rather, they are called *drupaceous* fruits, having the two outer coats not fleshy, but woody or leathery.

374. *What is a Nut?*—It is a dry, hard, indehiscent shell, hav-

ing but one cell and one seed (with the rudiment of another). It has no soft and fleshy coat like the drupe, but is seated in a kind of involucre, called a *cupule*; as, the Chestnut, Beechnut, Acorn, Hazelnut. (170.)

375. *How do you account for its rudiment of a second seed?*—The ovary from which the nut is produced, has two cells and two ovules, but one of the cells with its ovule is suppressed, that is, never grows, while the other enlarges and occupies the whole shell of the fruit.

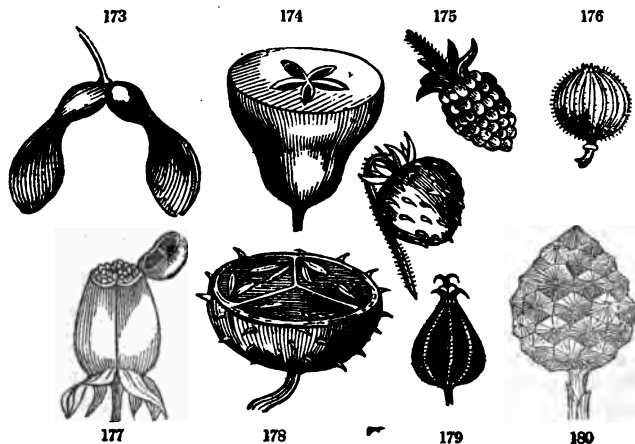


Fig. 172.

Fig. 172, a winged nut of the Birch.—*a*, cross section; *b* perpendicular section, giving different views of the rudiment. *Explain it.*

376. *Describe a Caryópsis.*—It is a kernel—a small, dry, seed-like, one-celled, simple fruit, inseparable from the seed which it encloses, as in Maize, Wheat, Carex, and most of the grasses.

377. *An Achénium.*—A small, dry, seed-like, one-celled, indehiscent fruit, not inseparable from the seed which it encloses, as in the Crow-foot, Borragé, Aster, and the Compositæ generally.



Forms of Fruit.

378. *A Utricle*.—Differs but little from an achenium, being a little membranous fruit more or less inflated, with a single seed; as in the Pigweed.

379. *A Samāra*.—A winged fruit—dry and one-seeded, lengthened at the apex into a wing-like appendage, as in the Maple, where they are double, or in the Ash, where they are single. (173.)

380. *A Pyxis*.—A capsule opening across by a lid, as in the Purslane, Plantain, Henbane (177).

381. *A Pome*.—A fleshy, indehiscent pericarp (like the Apple), formed of the permanent, adherent calyx, and containing several cartilaginous cells. (174.)

382. *A Pepo*.—A fleshy, indehiscent pericarp like the Pumpkin, Cucumber, Gourd and Squash. (178.)

383. *A Berry*.—This is a soft and fleshy fruit, always indehiscent, enclosing many seeds in its pulp; as, the Currant, Grape. (176.)

384. *What say you of the Strawberry?*—It is not a berry, but a fleshy receptacle, bearing the achenia (which resemble seeds) on the outside (181).

385. *What of the Blackberry, Raspberry, &c.?*—These fruits are compounded of many achenia, each enclosed in a coat of pulp (175).

386. *Describe a Stróbile*.—This is the hard, scaly fruit of the Pine, and other Coniferæ (180).

LESSON XVIII.

OF THE SEED.

387. *How will you characterize the Seed?*—The seed is the full-grown ovule, the last product of vegetation, containing the embryo of a new plant which is similar in all respects to the original plant.

388. *What are the parts of the Seed?*—The ÉMBRYO, the TESTA (or skin), and (sometimes) the ALBÚMEN.

389. *Describe the Embryo*.—The ÉMBRYO is an organized, or living body, the rudiments of the young plant, situated within the

coverings of the seed. To promote the growth of this, all the other parts not only of the seed, but of the fruit and flower seem designed. In some seeds the embryo is plainly seen; as in the Bean, Pea, Morning-glory. In other seeds it is very small.



390. *Describe the parts of the Embryo.*—They are seen in this figure (181*, &c) as follows:—the *radicle* (a), or young root; the *plumule* (b), the ascending part, or young stem with the *cotyledons*, the young leaves, bulky and porous, generally stored with nutriment for the whole.

391. *Does the Embryo occupy the whole space within the coats of the seed?*—In many plants it does, as in the seeds of the Apple, Rose and all the Roseworts, and also of the Leguminous plants. But more commonly a part of the space is occupied by albumen.

392. *What is the Albumen?*—The Albumen of the seed is a collection of starch and other similar matter, designed for the nourishment of the embryo while in the first stages of its growth. Seeds are therefore said to be *albuminous* and *exalbuminous*.

393. *In Albuminous seeds, how is the embryo situated?*—It is generally found lying in the midst of the albumen, surrounded by it. But often it is found outside the albumen, either coiled around it, as in the Poke plant, Purslane, or lying at the end of it as in the Grasses. (Figs. 181*, 182, 183, and 186.)

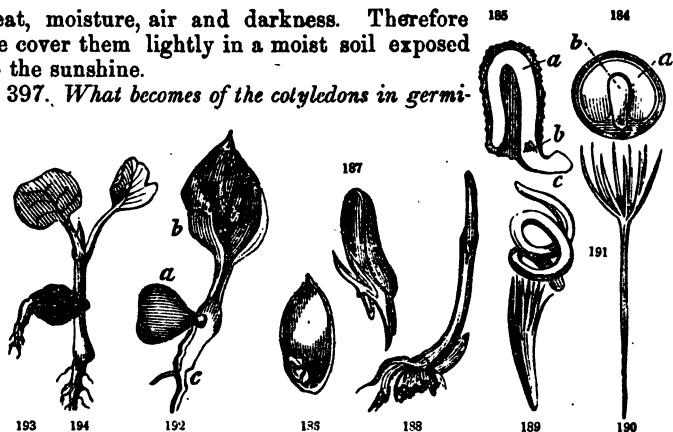
394. *What is said of the number of the Cotyledons?*—The number of the cotyledons of the embryo is variable. In the Crowfoots, Crucifers, and all the Exogens (§ 111, 112), there are two cotyledons. In the Lilyworts, Orchids, and Endogens generally, there is but one cotyledon. In the Conifers there are several, and in the *Cuscuta* there is none at all.

395. *What is signified by the term Germination?*—The word denotes the earliest growth of the embryo in the seed, or the first stages of vegetation in a plant.

396. *What are the requisite conditions of Germination?*—In order that seeds may germinate, they should have a certain amount of

heat, moisture, air and darkness. Therefore we cover them lightly in a moist soil exposed to the sunshine.

397. *What becomes of the cotyledons in germi-*



nation?—They generally rise above the surface, in the *Éxogens*, and expand into the two first and lowest leaves, as seen in the Bean, Beech-nut, Maple. But in the *Endogens*, the single cotyledon remains below the surface.

398. *What is said of the fruit of the Cryptogamia?*—The Flowerless Plants, as the Ferns and Mosses, produce *spores* instead of seeds. These have no appearance of an embryo, but appear similar to the pollen grains (§ 302) of other plants.

(*Explain the figures.*—Fig 184, seed of Canna (Indian Shot): *a*, albumen; *b*, embryo with one cotyledon. 185, Water-Plantain: *a*, its one cotyledon; *b*, plumule; *c*, rootlet. 186, Grass seed, cut through, showing the embryo at one end. 187, The same beginning to sprout. 188, The same having grown to a young plant. 189, Pine seed with its many cotyledons. 190, The same having become a little plant. 191, Embryo of the Dodder seed. 192, Seed of the Calla becoming a young plant. 193, Fruit of the Four-o'clock germinating. 194, The same having thrown off the pericarp and become a plant.)

LESSON XIX.

SYSTEMATIC BOTANY.

399. *What is the subject of this Lesson?*—We are now about to examine some of the best methods of classifying or arranging plants, so that we may be able to study them as constituting one grand System.

400. *What are some of the benefits of Systematic Botany?*—When we examine a plant in relation to the great System of which it is a part, we see much more that is interesting and admirable in its organization, than when we study it alone.

401. *Illustrate your meaning.*—Suppose that I should pick up in the way the balance-wheel of a watch. I might think it curious, and neatly made; but I should have no idea of its value, or of the skill of its contrivance, until I had found out *its relation to the other wheels* and parts of the watch;—in other words, until I understood how it worked with the other wheels.

402. *How do these studies affect us in view of the Great Creator?*—We here discover a new and vast design in the Vegetable Kingdom, leading us to adore and love that great and good Being who planned and created the world. For we see that He has not only made each plant with so much loveliness and perfection in itself, but has also assigned to each species its own proper rank in the System, and endowed it with just that nature, habit, and style of beauty which adapt it to its rank.

403. *You have already learned how to define a Species and a Genus (§ 24–28); but as these divisions are very important, will you now repeat, first, the definition of a Species?*—(§ 24.)

404. *Also the definition of a Genus?*—(§ 27.)

405. *Is there more than one method of Classification?*—Yes, many.

406. *In what respect do they all agree?*—They all agree in having the same genera and species, but differ very much in their methods of arranging or grouping the genera.

407. *What two methods are the most important to us?*—The Natural and the Artificial—the one according to *nature*, the other invented by *art*.

408. *Can you give an illustration of an artificial arrangement?*—Suppose you were arranging the books of a large library in good order upon the shelves. If you should place all those of the folio size upon the lower shelves, of the quarto size upon the second shelves, of the octavo size next, the duodecimo and the 18mo on the upper shelves, you would have an artificial arrangement, because you had respect to the single quality of *size* only.

409. *Of a natural arrangement?*—But suppose you should arrange your books according to the subjects of which they treat, placing the poetical works in one department, the works of fiction in another, of history in another, of mathematics in another, and of natural science in another;—this would be a natural arrangement, because founded upon the real nature of the works.

§. OF THE ARTIFICIAL SYSTEM.

410. *Give an account of the Artificial System of classification.*—In this System plants are arranged according to the stamens and pistils only, leaving all other characters out of view. It was invented by Linnæus, one of the earliest and best of botanists, and is sometimes called the Linnæan Arrangement.

411. (Here, if necessary, let the pupil review the definitions of the Artificial Classes, § 313–318, also the Artificial Orders, § 329.)

412. The following table will aid the learner in understanding the true characters which distinguish the 24 Linnæan Classes, and also enable him to determine readily to which Class any plant may belong. The use of the table is so manifest, that no explanation more than the teacher can give may be necessary; still, the directions immediately following it may be found useful to some.

A VIEW OF THE LINNÆAN SYSTEM.

- Class.
- 1 Plants never having stamens or pistils (*belong to*)..... CRYPTOGAMIA, 24
 - 1 Plants having stamens and pistils (*Pass on to the lines numbered*)....2
 - 2 Stamens and pistils in the same flower (*Pass to numbers*)....4.
 - 2 Stamens and pistils in separate flowers....3.
 - 3 Some of the flowers ♂, some ♀, some ♂, on 1, 2, or 3 different individual plants..... POLYGAMIA, 23
 - 3 Staminate flowers on some plants, and pistillate on others..... DIÖ'CIA, 22
 - 3 Staminate and pistillate flowers on the same individual plant, MONÖ'CIA, 21
 - 4 Stamens adhering to the pistils in one column..... GYNÁNDRIA, 20
 - 4 Stamens free (§ 328) from the pistils....5
 - 5 Stamens connected with each other by their anthers..... SYNGENËSIA, 19
 - 5 Stamens connected with each other by their filaments....6
 - 5 Stamens not connected with each other....7
 - 6 Filaments united in more than two sets..... POLYADÉLPHIA, 18
 - 6 Filaments united in two sets..... DIADÉLPHIA, 17
 - 6 Filaments united in one set..... MONADÉLPHIA, 16
 - 7 Stamens of unequal length (either 4 or 6)....8
 - 7 Stamens of equal length (from 1 to 100 or more)....9
 - 8 Stamens 6, two of them shorter than the other 4..... TETRADYNÁMIA, 15
 - 8 Stamens 4, 2 of them shorter than the other 2..... DIDYNÁMIA, 14
 - 9 Stamens indefinite (too many to be readily counted, and variable)....1
 - 9 Stamens definite in number....11
 - 10 Stamens not adhering to the calyx..... POLYÁNDRIA, 13
 - 10 Stamens adhering to the calyx..... ICOSÁNDRIA, 12
 - 11 Stamens twelve in number..... DODECÁNDRIA, 11
 - 11 Stamens ten..... DECÁNDRIA, 10
 - 11 Stamens nine..... ENNEÁNDRIA, 9
 - 11 Stamens eight..... OCTÁNDRIA, 8
 - 11 Stamens seven..... HEPTÁNDRIA, 7
 - 11 Stamens six..... HEXÁNDRIA, 6
 - 11 Stamens five..... PENTÁNDRIA, 5

11 Stamens four.....	TETRÁNDRIA, 4
11 Stamens three.....	TRIÁNDRIA, 3
11 Stamens two.....	DIÁNDRIA, 2
11 Stamens one.....	MONÁNDRIA, 1

Directions in using this and other similar Tables.

To find by this table the class of any plant which you may have in hand, commence with the first lines and decide which of them applies to your plant. If it "have stamens and pistils," pass on to the lines numbered 2, and see which of them applies. If your specimen "have stamens and pistils in the same flower," pass to numbers 4, and decide. If now your plant have "stamens adhering to the pistils," it belongs to Gynandria: if not, pass on to 5s, and if the third line there applies, pass to 7s. If only the second of these lines applies, pass to 9s. Now if you find the stamens in your plant to be "definite," pass to the numbers 11. Are there 5 stamens? then your plant belongs to Pentandria.

LESSON XX.

OF THE NATURAL SYSTEM

413. *What is the object and aim of the Natural System?*—It is to classify and arrange the Genera of plants, as nearly as possible, in the order of nature, so that those only shall be grouped together which most resemble each other in *all respects*.

414. *According to this System, what is the first division made of the Vegetable Kingdom?*—All the Genera of plants are first divided into the two Grand Divisions mentioned in § 21.

415. *Will you here repeat the characteristics of the Phanogamia?*—They have such *stems, leaves, flowers and seeds* as have been already described in this book.

416. *The Cryptogamia?*—These have often no regular stem, nor such leaves as have been described, *nor flowers of any kind*; and they produce, instead of seeds, minute, dust-like bodies called *spores*.

417. *What is the next step in the Natural System?*—The Phanogamia or Flowering Plants are next separated into the two great subdivisions mentioned in § 110.

418. *Please recite their characters again.*

The EXOGENS have the wood in circular layers,
— the leaves with netted veins,
— the flowers four or five-parted, and
— the seeds with two or more cotyledons.

The ENDOGENS have the wood in confused order,
— the leaves with parallel veins,
— the flowers three-parted, and
— the seeds with one cotyledon.

419. *What is the third step in this System?*—The Exogens are divided into two Natural Classes, namely, the Angiosperms and Gymnosperms.

420. *How are these two Classes to be distinguished?*—By the following marks.

The ANGIOSPERMS have stigmas as well as stamens in the flowers, and
— fruit consisting of a pericarp enclosing the seeds.

The GYMNOSPERMS have no stigmas in their flowers, and
— fruit consisting of *naked seeds*, not enclosed in an ovary or pericarp; as, the Pines, Spruces and Firs.

421. *Will you now tell us how the Angiosperms are divided?*—They are usually divided into three sub-classes, as follows:

The POLYPÉTALÆ, having calyx and corolla, the latter with *distinct* petals.

The MONOPÉTALÆ, having calyx and corolla, the latter with *united* petals.

The APÉTALÆ, having no corolla and often no calyx.

422. *We will now return to the Endogens: how are they divided?*—Into two very distinct Natural Classes, whose characters are as follows, viz.:

The AGLUMACEÆ, having flowers without glumes, and

The GLUMACEÆ, having flowers furnished with glumes, or chaff.

423. *How are the Cryptogamia divided?*—Also into two Natural Classes, thus named and distinguished:

The A'CROGENS, having a regular stem with leaf-like appendages, and

The THÁLLOGENS, plants of the lowest grade, with no distinction of root, stem and leaves.

424. *In the following table these six Classes, together with the other principal divisions of the Natural System, are so arranged as to show their relations to each other at a glance. Please repeat and explain it.*

VEGETABLE KINGDOM,	{	PHENOGAMIA,	{	E'XOGENS,	{	A'NGIOSPERMS.	CLASS 1.		
					{	GY'MNOSPERMS.	" 2.		
		CRYPTOGAMIA,		E'NDOGENS,		{	AGLUMACEÆ.	" 3.	
						{	GLUMACEÆ.	" 4.	
						{	A'CROGENS.	" 5.	
						{	THÁLLOGENS.	" 6.	

425. *Another table of the Natural Classes is here given, showing their most essential characters. The pupil is requested to explain it, and decide by it the Class to which any plant at hand belongs.*

A VIEW OF THE NATURAL CLASSES, &c.

- 1 Plants bearing flowers (Phænogamia)....2
- 1 Plants never bearing flowers (Cryptogamia) ...5
- 2 Leaves net-veined. Flowers never entirely 3-parted (Exogens)....3
- 2 Lvs. parallel-veined (rarely net-veined). Fls. 3-parted (Endogens)....4
- 3 Stigmas present. Seeds enclosed in a pericarp.....6 ANGIOSPERMS, I.
- 3 Stigmas none. Sds. quite naked (Pines, Spruces, &c.) GY'MNOSPERMS, II.
- 4 Flowers without glumes, mostly colored AGLUMÀCÆE, III.
- 4 Flowers with glumes, and always colorless..... GLUMÀCÆE, IV.
- 5 Stems and leaves distinguishable..... A'CROGENS, V.
- 5 Stems and leaves undistinguishable..... THÁLLOGENS, VI.
- 6 Corolla with distinct petals.....Polypetalæ.
- 6 Corolla with united petals.....Monopetalæ.
- 6 Corolla none. Sepals united or none.....Apetalæ.

4. OF THE NATURAL ORDERS.

426. *What is remarked concerning the Natural Orders or Families?*—These are the most important of all the natural associations. Botanists have taken the greatest pains to render the characters of the Orders accurate and distinct, and the student's progress will chiefly depend on his knowledge of them.

427. *How are Orders formed?*—By placing together those Genera which most nearly resemble each other in character and properties.

428. *Can you give an illustration?*—The Cruciferae, or the Mustard family includes all those Genera which have cruciform flowers, siliquose fruit, didynamous stamens, alternate leaves, no stipules, &c.; as Mustard, Cabbage, Turnip, Radish, Rocket, Shepherd's-purse, &c.

429. *What say you of the number of Genera in the different Orders?*—The number is very variable. Some Orders are made up of a single Genus, as the Nelumbiaceae (Order 8), while others embrace several hundred Genera, as the Compositae (Order 75).

430. *Can you now recite the various divisions of the Natural System?*—In the Natural System, Individuals form Species,

Species form Genera,

Genera form Orders,

Orders form Classes,

Classes form Grand Divisions, and

Two Grand Divisions constitute the Vegetable Kingdom.

LESSON XXI.

CONCERNING THE ANALYSIS OF PLANTS

431. *Define the term Analysis.*—The study of any object by the separate examination of its parts, is called ANALYSIS.

432. *Illustrate.*—Thus, in Grammar we analyze a sentence when we point out and separately consider the *subject*, the *predicate*, the *object*, with their *modifiers*, &c. In Chemistry we analyze water

when we separate it into its two elements, *oxygen* and *hydrogen*, and examine them apart.

433. *What then is Analysis in Botany?*—Botanical Analysis implies a separate examination of the several parts or organs of which a plant is composed, according to the rules of the Science, in order to determine its characters, affinities, names, habits, properties and uses.

434. *What is the pursuit of the active Botanist?*—He is diligently and delightfully employed in the discovery and analysis of plants. For without this exercise, the study of books would lose half its usefulness and pleasure. The student can gain a better knowledge of a plant in a few minutes, by a careful examination of a living specimen, than by committing to memory the longest descriptions found in books.

435. During the flowering months, you may often in your walks meet with plants in blossom with which you are unacquainted. If you are duly interested in your study, and are sufficiently advanced, you will not fail to seize and analyze each new specimen while the short hour of its bloom may last, and even extend your walk in search of more. Thus in a few seasons you may become acquainted with about every species that is found in the vicinity.

436. But we do not expect this object will be accomplished by our young friends while engaged in the study of the "First Lessons in Botany." We only aim *now* to furnish you with the means of making a *good beginning* in this interesting and improving labor, so that you may be able to go forward, in future seasons, with the "Class-Book of Botany," or other works of that rank.

437. In the following pages we present you with many useful tables for Botanical Analysis, accompanied by a miniature FLORA, or a partial description of all the Flowering plants in the United States. (*See Suggestions to Teachers, page 5.*)

§. PARTICULAR DIRECTIONS IN ANALYSIS.

438. *What is the proper condition of a plant for analysis?*—It should have flowers in full bloom, and if possible, a portion of them in fruit also, and accompanied with full-grown leaves. And when

you gather specimens, do not think it sufficient to gather the flowers with some of the *upper* leaves, but if the plant be an herb, take care to gather some of the *lower* leaves also.

439. *Let us now suppose you have found a plant in the proper state for analysis ; what is the first step which you are to take ?*—I should first carefully examine the several *parts* of the plant, one by one, beginning with the root and ending with the ovaries, and determine their characters according to the definitions in the former Lessons.

440. *After having thus gained a good knowledge of the specimen, what next ?*—I should next refer to the “View of the Natural System” on page 79, commencing as near the beginning as necessary, reading, comparing and deciding, in order to learn the Natural Order of the plant.

441. *And what then ?*—Turn to that Order, and learn its genus and species in the same manner.

442. *What care is to be taken throughout the whole examination ?*—I should take the greatest care to avoid mistakes.

443. *The following are some of the best and safest distinctions, deserving particular notice. Will you state what you inquire respecting the Plants ?*—Whether they are herbs, shrubs, or trees. (§ 58–62.)

444. *The Stipules ?*—Whether present or wanting. (§ 224.)

445. *The Leaves ?*—Whether alternate or opposite, —parallel-veined or net-veined ; whether the figure be ovate, or oval, or lanceolate, &c. (Less. VI.)

446. *The Flowers ?*—Whether symmetrical or unsymmetrical (§ 336), regular or irregular. (§ 338.)

447. *The Calyx ?*—Whether free, half-free, or adherent. (§ 273.)

448. *The Petals ?*—Whether united or distinct ; whether alternate with the stamens or opposite to them.

449. *The Stamens ?*—Whether hypogynous, perigynous, or epigynous. (§ 309, &c.)

450. *The Carpels ?*—Whether single or several, distinct or united. (§ 317.)

§. VARIOUS SUGGESTIONS, CAUTIONS, &c.

451. *How much acquaintance with the characters of the Six Natural Classes is needful?*—The student should understand them so well as to be able, at first sight, to determine to which of them any plant belongs.

452. *Are their characters always obvious and certain?*—They are generally, but we must not be surprised to find some exceptions.

453. *In the Natural System, will any ONE character alone distinguish all the plants of any Class or Order?*—It will not; but a combination of characters is often needed.

454. *Explain your meaning by an example or two.*—Although net-veined leaves are in general characteristic of Exogens, and parallel-veined of Endogens, yet there are a few Exogens with parallel-veined leaves and a few Endogens with net-veined. Again, although 3-parted flowers are in general characteristic of Endogens, a few of them have 4-parted and 2-parted, while several of the Exogens have 3-parted. Therefore we must combine these two distinctions of leaves and flowers, in order to make out a distinction that will answer in all cases.

455. *How combine them?*—Thus: No Exogen has its flowers completely 3-parted (that is, sepals, petals, stamens and carpels, all in 3s); hence if your plant have such flowers, however its leaves may be, it is an Endogen, &c. See the 2d couplet (or pair of lines) in the "View of the Natural Classes," p. 81.

456. *How may we most readily know an Angiosperm?*—The Angiosperms may always be known by the presence of stigmas in their flowers, and the Gymnosperms by having no stigmas; but as this is often an obscure character, it is well to remember that all the Gymnosperms, or plants without stigmas, are trees and shrubs; such as the Pines, Spruces, Cedars, &c., and (except the Larch) evergreen.

457. (We shall close this lesson by briefly stating the characters of the following eight Natural Orders. As they are very easily defined, and very large, embracing more than one-third of all our flowering plants, it will greatly aid the learner, and save his too frequent reference to the tables, to commit these brief distinctions to memory.)

EXOGENS.

458. *Please state carefully the characters of the Crucifers.*—They are herbs with alternate leaves cruciform flowers (§ 288), 2 stamens shorter than the other 4, and 2-celled pods. (Artificial class, *Tetradynamia*, § 310, 315.) Example, Mustard.

459. *Of the Leguminous family.*—Plants with 1-celled pods (§ 162), and mostly papilionaceous corollas (§ 292) and compound leaves (§ 154). (Artificial Class *Diadelphia*, nearly. § 311, 17.) Pea.

460. *The Umbelifers.*—Herbs with alternate leaves, small, regular, 5-parted flowers in umbels, and 2-seeded fruit. Caraway.

461. *The Composite Family.*—Herbs with compound flowers, that is, with heads composed of many minute 5-parted flowers, appearing together like a single flower (§ 253). Asters, Sunflower. (Artificial Class *Syngenesia*, § 311, 19.)

462. *The Labiate Family.*—Herbs with square stems, opposite leaves, labiate flowers (§ 285), and fruit deeply-cleft into four parts. Peppermint.

ENDOGENS.

463. *The Orchids.*—Herbs with very irregular and grotesque flowers, and stamens united to the style. (Artificial Class *Gynandria*, § 311, 20.) Orchis.

464. *The Sedges.*—Herbs with solid stems, linear, grass-like leaves (if any) on entire sheaths, and with green glumes and flowers.

465. *The Grasses.*—Herbs with hollow stems, linear leaves on split sheaths, and with green glumes and flowers.

LESSON XXII.

ABOUT PRESERVING PLANTS.

466. *In what light may the preservation of Plants be regarded?*—Almost as one of the Fine Arts; for in the practice of it there is room for the exhibition of much taste and skill, and when prepared

in a proper manner, an HERBARIUM is a truly beautiful and interesting work.

467.—*What apparatus is necessary in collecting plants?*—A tin box of some convenient form, about 18 inches in length, shutting closely. In such a box gathered specimens may be kept several days fresh and unfading.

468. *What apparatus for drying them?*—1st, a dozen quires of soft, unsized paper (such as printing paper or old newspapers), about 15 inches long and 11 inches wide when folded; 2nd, a small quantity of cotton batting; 3d, a small screw press with boards of the same size as the paper, or several lead weights varying from 12 to 30 pounds each.

469. *What are the directions to be observed in gathering specimens for the herbarium?*—The same as have already been given for analysis (§ 438).

470. *State next the process of pressing and drying.*—The specimens are to be freed from water (if gathered in the dew or in a wet day), and then spread out as nearly in their natural position as possible, between about 12 thicknesses of paper. Then let them be submitted to pressure, but the pressure should be equalized by the cotton batting, and should never be severe enough to crush the parts.

471. *How often should they be changed?*—As often as once or twice each day until perfectly dry, they should be transferred to fresh and dry paper. It is also well to keep the press in a warm place. By carefully observing all these directions, your dried specimens will retain almost all the beauties of the living plant.

472. *What is the next object with the collector?*—To arrange his specimens. For this purpose he procures a quantity of fine, white, rather firm paper, about 14 inches long and 10 inches wide when folded, and between the folds of each sheet places the specimens of one species, together with a card labeled with its names, &c.

473. *Are there any directions respecting the label?*—In writing the Latin names of the species, commence them with a capital or a small letter just as you find them in the book you use. The rules respecting these things perhaps you will hereafter learn in the Class-Book of Botany (page 118, second edition).

SYNOPSIS,

OR

REVIEW OF THE NATURAL SYSTEM,

BY WHICH THE STUDENT MAY READILY DETERMINE THE NATURAL ORDER OF
ANY FLOWERING PLANT GROWING WITHIN THE LIMITS OF THE U. STATES.

NOTE.—A star (*) annexed to the number of a Natural Order denotes that *that* Order, with its Genera and Species, is described in its place in the Flora. Those orders not thus marked are not noticed in the Flora beyond this Synopsis. The Orders are here numbered as in the "Class Book of Botany."

§ *Classes and Sub-classes.*

- 1 Plants bearing flowers....2 (**Phænogamia.**)
- 1 Plants never bearing flowers....5 (**Cryptogamia.**)
- 2 Leaves net-veined. Flowers never entirely 3-parted....3 (**Exogens.**)
- 2 Lvs. parallel-veined (rarely net-veined). Fls. 3-parted....4 (**Endogens.**)
 - 3 Stigmas present. Seeds enclosed in a pericarp....6 (**Angiosperms. 1.**)
 - 3 Stig. none. Seeds quite naked (Pines, &c.)....144 (**Gymnosperms. 2.**)
- 4 Fls. without glumes, mostly colored, often green....145 (**Aglumacæ. 3.**)
- 4 Fls. with green glumes, no perianth, and 1-seeded fr....167 (**Glumacæ. 4.**)
 - 5 Stems and leaves distinguishable.....(**Acrogens. 5.**)
 - 5 Stems and leaves undistinguishable.....(**Thallogens. 6.**)
- 6 Corolla with distinct petals....7 (**Polypetalæ.**)
- 6 Corolla with united petals....76 (**Monopetalæ.**)
- 6 Corolla none. Sepals sometimes none....117 (**Apetalæ.**)

§§ *Orders of the Polypetalous Exogens.*

- 7 Herbs (§ 62)....8
- 7 Shrubs and trees (§ 59, 60)....54
- 8 Leaves alternate or all radical....9
- 8 Leaves cauline (§ 146), opposite, at least the lower ones....38
 - 9 Stipules present (§ 244)....34
 - 9 Stipules none....10

- 10 Polyandrous—stamens (15—200) indefinite 11
- 10 Oligandrous—stamens few, definite 17
- 11 Stamens hypogynous—situated on the receptacle (§ 314, 13) 12
- 11 Stamens perigynous—situated on the calyx or corolla (§ 314, 12) 16
- 12 Ovaries simple; fruit acheniate, folliculate, &c., never capsular 13
- 12 Ovaries united into a compound capsule 15
- 13 Leaves never peltate, mostly many-cleft. *Crowfoots*... RANUNCULACEÆ. 1*
- 13 Lvs. centrally peltate (§ 173, 23). Plants aquatic (growing in water) 14
- 14 Sepals and petals definite (2—4). Lvs. oblong. *Watershields*. CABOMBACEÆ. 7
- 14 Sepals and petals indefinite, numerous. Leaves orbicular. NELUMBIACEÆ. 8*
- 15 Sepals and petals numerous, indef. Plants aquatic... NYMPHEACEÆ. 9*
- 15 Sepals and petals 5. Lvs. pitcher or trumpet form... SARRACENIACEÆ. 10*
- 15 Sepals 2. Juice usually colored. *Poppys*... PAPAVERACEÆ. 11*
- 16 Sepals and petals 5—10 75
- 16 Sepals and petals many and undistinguishable. *Indian Figs*. CACTACEÆ. 61
- 17 Flowers very irregular 18
- 17 Flowers regular or nearly so 20
- 18 Filaments 6 or 8, united below into one or two sets 19
- 18 Filaments 5, cohering only at top. *Jewel-weeds*... BALSAMINACEÆ. 23
- 18 Filaments 8, distinct. Lvs. simple, peltate. *Trophyworts*. TROPEOLACEÆ. 29
- 18 Fils. 8, distinct. Lvs. biternate, with tendrils. *Soapworts*. SAPINDACEÆ. 44
- 19 Leaves much dissected and divided. *Fumeworts*... FUMARIACEÆ. 12
- 19 Leaves simple, entire. *Milkworts*... POLYGALACEÆ. 16*
- 20 Ovaries superior—free from the calyx or nearly so (§ 328) 21
- 20 Ovaries inferior—wholly adherent to the calyx (§ 328) 32
- 21 Sepals 2. Fleshy herbs. *Purselanes*... PORTULACACEÆ. 24
- 21 Sepals 3 or more 22. (Leafless, and not green 93)
- 22 Stamens hypogynous—inserted on the receptacle 23
- 22 Stamens perigynous—inserted on the calyx 31
- 23 Sepals, petals and stamens symmetrical (§ 336) 24
- 23 Sepals, petals and stamens unsymmetrical. Fruit a pod 29
- 24 Carpels solitary, fruit simple, 1-celled. *Berberids*... BERBERIDACEÆ. 6*
- 24 Carpels 3—5, more or less united 25
- 25 Leaves simple 26
- 25 Leaves compound 27

- 26 Ovary and capsule 1-celled. Aquatic plants. *Sun-dews*. DROSERACEÆ. 18*
- 26 Ovary and capsule 5—10-celled. Stamens 5. *Flaxworts*..... LINACEÆ. 26
- 26 Ovary and capsule 5-celled. Stamens 10....83
- 27 Plants aquatic. Fr. 2—5 fleshy nuts. Juice acrid. *Floerkea*. LIMNANTHES. 30
- 27 Plants not aquatic....28
- 28 Leaves palmately 3-foliolate. Juice acid. *Wood-sorrels*... OXALIDACEÆ. 31*
- 28 Leaves pinnate. Juice bitter. *Rueworts*..... RUTACEÆ. 34
- 29 Fls. crucif. (§ 288). Pods 2-carp., 2-celled. *Mustardworts*. CRUCIFERÆ. 13*
- 29 Flowers not cruciform....30
- 30 Pods 2-carpeled, 1-celled. *Capparids*. CAPPARIDACEÆ. 14
- 30 Pods 3—6-carpeled, 1-celled. *Mignonettes*. RESEDACEÆ. 15
- 31 Styles 5. Stamens 5, opposite to the petals. Fruit 1-celled....85
- 31 Styles 3—20, as many as the sepals. *Houseleeks*..... CRASSULACEÆ. 64*
- 31 Styles 3, fewer than the sepals. *S. Turnera*. TURNERACEÆ. 58
- 31 Styles 2, fewer than the sepals. *Saxifrages*. SAXIFRAGACEÆ. 65*
- 31 Styles (or stigmas) 4, fewer than sepals. *Parnassia*... DROSERACEÆ. 18*
- 32 Flowers in simple or compound umbels....33
- 32 Flowers in racemes, or solitary, &c. *Evening Primroses*. ONAGRACEÆ. 55*
- 33 Carpels 2, dry, separable, 1-seeded, indehiscent..... UMBELLIFERÆ. 67*
- 33 Carpels 2—5, inseparably combined into a berry or drupe. ARALIACEÆ. 68
- 34 Flowers regular....35 -
- 34 Flowers irregular....36
- 35 Stamens monadelphous (§ 311, 16)—filaments united.... MALVACEÆ. 37*
- 35 Stamens distinct. *Roseworts*. ROSACEÆ. 48*
- 36 Fruit a 3-celled capsule....37
- 36 Fruit a legume (§ 362), with 1 or several seeds. LEGUMINOSÆ. 47*
- 37 Capsule with 3 broad wings. Monœc. (§ 312, 21). *Begonia*. BEGONIACEÆ. 5£
- 37 Capsule not winged. Flowers perfect. *Violets*..... VIOLACEÆ. 17*
- 38 Stipules present, sometimes very small....39
- 38 Stipules none....41
- 39 Ovaries 5, distinct and 1-seeded in fruit. *Gerania*. ... GERANIACEÆ. 27*
- 39 Ovary compound, 1—5-celled....40.
- 40 Sepals, petals and stamens 5. *Knottworts*. ILLECEBRACEÆ. 22
- 40 Sepals, petals, stamens and styles 2 or 3. Aquatic plants. ELATINACEÆ. 25
- 41 Flowers very irregular. *Milkworts*..... POLYGALACEÆ. 16*
- 41 Flowers regular, or slightly unequal....42

- 42 Ovaries inferior or adhering to the calyx....43
- 42 Ovaries superior or free from the calyx....45
- 43 Cal. adher. only to the angles of the ova. *Deer Grass*. MELASTOMACEÆ. 51
- 43 Calyx tube wholly adherent to the ovary....44
- 44 Involucre 4-leaved, white, subtending the small cyme..... CORNACEÆ. 69*
- 44 Involucre none. Leaves numerous. *Onagrad*..... ONAGRACEÆ. 55*
- 44 Inv. none. Leaves 3 only, compound. *Ginseng, Panax*. ARALIACEÆ. 68
- 45 Ovaries many, distinct, simple, acheniate, caudate.. RANUNCULACEÆ. 1*
- 45 Ovary 1, simple. Lvs. 2 only. *Podophyllum, May Apple*. BERBERIDACEÆ. 6*
- 45 Ovary compound....46
- 46 Sepals 2, fewer than the petals. *Purselanes*..... PORTULACACEÆ. 24
- 46 Sepals 3—5, more or less united....47
- 47 Styles united into one....48
- 47 Styles distinct....49
- 48 Sepals equal, combined into a tube. *Loose-strifes*..... LYTHRACEÆ. 52
- 48 Sepals unequal, nearly distinct. *Rock-roses*..... CISTACEÆ. 19
- 49 Stamens hypogynous (arising from the receptacle)....50
- 49 Stamens perigynous (arising from the calyx)....51
- 50 St. tumid at the nodes. Lvs. not punctate. *Pinkworts*. CARYOPHYLLACEÆ. 33*
- 50 Stem often 2-edged. Leaves with pellucid and black dots. HYPERICACEÆ. 20*
- 51 Sta. 20 or more, indefinite. Exotic plants. *Ice-plants*. MESEMBRYACEÆ. 62
- 51 Stamens fewer than 20, definite....52
- 52 Carpels (follicles) distinct, as many as the sepals..... CRASSULACEÆ. 64*
- 52 Carpels 2—5, partly or completely united....53
- 53 Styles 3—5. Embryo coiled around the albumen. CARYOPHYLLACEÆ. 23*
- 53 Sty. 2. Embryo straight in the midst of the albumen. SAXIFRAGACEÆ. 65*
- 54 Leaves opposite....55
- 54 Leaves alternate....65
- 55 Stipules present, but soon falling off. Shrubs. *S'aff-trees*. CELASTRACEÆ. 45
- 55 Sti. present, between the petioles. Trees. *S. Mangle*. RHIZOPHORACEÆ. 53
- 55 Stipules none....56
- 56 Flowers irregular. *Horse-chestnuts. Buckeyes*..... HIPPOCASTANACEÆ. 43
- 56 Flowers regular....57
- 57 Stamens 20 or more, indefinite....58
- 57 Stamens fewer than 20, definite....61

- 58 Ovary superior—free from the calyx....60
- 58 Ovary inferior—adherent to the calyx....59
- 59 Ova. comp., of 3—5 carpels. Lvs. dotted. *St. Johnsworts*. HYPERICACEÆ. 20*
- 59 Ova. 00, simp., enclosed in the fleshy cal. *Car. Allspice*. CALYCANTHACEÆ. 49
- 60 Styles united into one. *Myrtleblooms*.....MYRTACEÆ. 50
- 60 Styles 4, distinct. *Philadelphus*. *False Syringa*.....SAXIFRAGACEÆ. 65*
- 61 Ovary superior—free from the calyx....62
- 61 Ovary inferior—adherent to the calyx....63
- 62 Fruit a 1-celled capsule. Low undershrubs (§ 61). *Rock-roses*. CISTACEÆ. 19
- 62 Fr. 2 united samaræ (§ 379). Erect shrubs and trees. *Maples*. ACERACEÆ. 42*
- 62 Fruit a 2-seeded berry. *Grape-vines*.....VITACEÆ. 38
- 63 Sty. 2, distinct. Cymes radiate (§ 255, a). *Hydrangea*. SAXIFRAGACEÆ. 65*
- 63 Styles united into one....64
- 64 Flowers axillary, solitary. Delicate house shrub. *Fuchsia*. ONAGRACEÆ. 55*
- 64 Fls. in cymes. Drupe 1—2-celled. Large shrubs or trees. CORNACEÆ. 69*
- 64 Fls. spicate or fascicled. Small parasites (§ 46). *Misseltoes*. LORANTHACEÆ. 70
- 65 Stip. large or small, sometimes only 2 glands, or found in the bud only..66
- 65 Stipules none. Flowers regular....70
- 66 Flowers regular....67
- 66 Flowers more or less irregular. *Leguminous Plants*.....LEGUMINOSÆ. 47*
- 67 Stamens 4 or 5, distinct. Erect shrubs....68
- 67 Sta. 5, united into one set. Climbing. *Passionflowers*. PASSIFLORACEÆ. 57
- 67 Stamens 20 or more, indefinite....69
- 68 Stamens opposite to the petals. *Buckthorns*.....RHAMNACEÆ. 46
- 69 Stamens alternate with the petals. *Staff-trees*.....CELASTRACEÆ. 45
- 69 Filaments distinct, hypogynous. Flowers very large. MAGNOLIACEÆ. 2*
- 69 Filaments distinct, perigynous. *Roseworts*.....ROSACEÆ. 48*
- 69 Filaments united into one set. Shrubs. *Mallows*.....MALVACEÆ. 37*
- 69 Filaments united into 5 sets. Fls. small. Trees *Bass-wood*. TILIACEÆ. 38
- 70 Fls. monœcious. Trailing vines. *South. Schizandra*....SCHIZANDRACEÆ. 4
- 70 Flowers diœcious. Climbing vines. *Moonseeds*.....MENISPERMACEÆ. 5
- 70 Flowers diœcious. Erect shrubs....71
- 70 Flowers perfect....72
- .1 Ovary superior—free from the calyx. *Prickly Ash*. ZANTHOXYLACEÆ. 32
- 71 Ovary inferior. Unarmed shrub. *Witch-hazel*.....HAMAMELACEÆ. 66

- 72 Stamens 18 or more, indefinite....73
- 72 Stamens 5, separate, standing on the calyx (perigynous, § 309, 12)....74
- 72 Sta. 5, 8, 10 or 14, separate, on the recept. Ovary free. Lvs. simple....114
- 72 Sta. 10, filaments united. Lvs. bipinnate. *Pride of India*....MELIACEÆ. 39
- 72 Sta. 10, separate. Leaves simple. Ovary inferior. *S*....COMBRETACEÆ. 54
- 72 Stamens 6, opposite to the petals. *Berberids*.....BERBERIDACEÆ. 6*
- 72 Stamens 4, alternate with the petals. *Corneils*.....CORNACEÆ. 69*
- 73 Fruit large fleshy pods. Calyx and cor. 3-parted. *Papaw*. ANONACEÆ. 4*
- 73 Fruit a several-celled capsule. Flowers 5-parted. TERNSTROMACEÆ. 36
- 73 Fruit a many-celled berry (orange § 383). *Orangeworts*. AURANTIACEÆ. 35
- 73 Fruit 5 follicles, or a drupe, or a pome, or a compound berry...ROS. 48*
- 74 Fruit a dry, 1-seeded drupe. *Sumachs*.....ANACARDIACEÆ. 33
- 74 Fruit a 2-celled, many-seeded capsule. *Itea*.....SAXIFRAGACEÆ. 65*
- 74 Fruit a 1-celled, globose berry. *Currantworts*.....GROSSULACEÆ. 60*
- 74 Fruit a 5-celled baccate drupe. *Araliads*.ARALIACEÆ. 68
- 75 Styles several, distinct. *Roseworts*.....ROSACEÆ. 48*
- 75 Styles united into one. *Loasads, Bartonia*.....LOASACEÆ. 56

§§§ Orders of the Monopetalous Exogens.

- 76 Herbs, annual, biennial or perennial....77
- 76 Trees, shrubs or under-shrubs....106
- 77 St. juicy, prostrate or climb., with tendrils. *Gourd worts*. CUCURBITACEÆ. 59
- 77 Stem not furnished with tendrils....78
- 78 Leaves alternate or all radical....79
- 78 Leaves opposite, cauline....95
- 78 Leaves none. Plants without verdure....93
- 79 Flowers regular, or else ligulate....80
- 79 Flowers irregular....90
- 80 Stamens 5, cohering by the anthers. Fls. in heads (§ 253). COMPOSITÆ. 75*
- 80 Stamens 4—10, distinct (or united and flowers not in heads)....81
- 81 Ovary inferior—adherent to the calyx tube....82
- 81 Ovary superior—free....(stamens 6, in 2 sets. A vine....19)....83
- 82 Stamens as many as the lobes of the corolla. *Bellworts*. CAMPANULACEÆ. 77*
- 82 Stamens twice as many as the lobes of the corolla.....ERICACEÆ. 78*

- 83 Stamens twice as many as the slightly united petals.....ERICACEÆ. 78*
- 83 Stamens as many as the lobes of the corolla....84
- 84 Stamens opposite to the lobes of the corolla....85
- 84 Stamens alternate with the lobes of the cor. Styles united into one....86
- 85 Ovary many-seeded. *Primroseworts*.....PRIMULACEÆ. 82*
- 85 Ovary 1-seeded. Petals scarcely united. *Leadworts*. PLUMBAGINACEÆ. 85
- 86 Acaulescent (§ 81). Fls. spicate. Fr. apyxis. *Plantains*. PLANTAGINACEÆ. 84
- 86 Caulescent. Stems leafy....87 (Fls. with a 5-hooded crown...105)
- 87 Fruit 4 nearly distinct achenia, or deeply 4-lobed.....BORRAGINACEÆ. 94*
- 87 Fruit 2 long, slender follicles. Flowers blue. *Amsonia*. APOCYNACEÆ. 101*
- 87 Fruit compound, capsular or baccate....88
- 88 Cor. twisted and imbricated in the bud. Fls. smallish. POLEMONIACEÆ. 96*
- 88 Cor. twisted and folded in the bud. Fls. quite large. CONVULVULACEÆ. 98*
- 88 Corolla in the bud not twisted....89
- 89 Fruit a few (2—4)-seeded capsule. *Hydrophylls*. HYDROPHYLLACEÆ. 95*
- 89 Fruit a many-seeded capsule or berry. *Nightshades*.....SOLANACEÆ. 99*
- 90 Ovary adherent to the calyx—inferior. *Lobeliads*.....LOBELIACEÆ. 76*
- 90 Ovary free from the calyx—superior....91 (Ov. 4-parted....87)
- 91 Stamens 2 or 4 and didynamous (§ 310, 14)....92
- 91 Stamens 5. Corolla slightly unequal....116
- 91 Stamens 5—8. Corolla very irregular, or fungous....18
- 91 Stamens 10. Corolla papilionaceous....36
- 92 Ovary 1-celled. Acaulescent, aquatic. *Bladderworts*.....LENTIBULACEÆ. 86
- 92 Ovary falsely 4-celled. Caulescent and not aquatic.....PEDALIACEÆ. 89
- 92 Ovary regularly 2-celled. *Figworts*.....SCROPHULARIACEÆ. 91*
- 93 Flowers regular. *Indian pipes*. *Monétropa*.....ERICACEÆ. 78*
- 93 Flowers irregular....94
- 94 Erect herbs. Color reddish-white or brown. *Broomrapes*. OROBANCHACEÆ. 87
- 94 Twining parasitic vines, orange-colored, *Dodder*.....CONVOLVULACEÆ. 98,
- 95 Herbs with a watery juice....96
- 95 Herbs with a milky juice. Fruit one or two follicles....105
- 96 Corolla limb quite regular, or else ligulate....97
- 96 Corolla limb more or less irregular....102
- 97 Flowers small, 1-seeded, in dense, involucrate heads.....COMPOSITE. 75*
- 97 Flowers in umbels, racemes, &c., not involucrate....98

- 98 Ovaries inferior—adherent....99
- 98 Ovaries superior, or nearly so....100
- 99 Fruit with 2 or more seeds. *Madderworts*.....RUBIACEÆ. 73*
- 99 Fruit with but one perfect seed. *Valerians*.....VALERIANACEÆ. 73
- 100 Fruit 4 nearly distinct achenia. Stamens 4.....LABIATÆ. 93*
- 100 Fruit a 2-celled, or twin capsule. Stamens 5. *Pinkroot*...RUBIACEÆ. 73*
- 100 Fruit a 3-celled capsule. Stamens 5. Fl. bud twisted. POLEMONIACEÆ. 98*
- 100 Fruit a 1-celled capsule, many-seeded. Stamens 4—12....101
- 101 Stamens opposite to the petals. *Primroseworts*.....PRIMULACEÆ. 82*
- 101 Stamens alternate with the petals. *Gentianworts*...GENTIANACEÆ. 100*
- 102 Ovary inferior—adherent to the calyx tube....103
- 102 Ovary superior—free from the calyx....104
- 103 Flowers in dense, involucrate heads. *Teazelworts*.....DIPSACEÆ. 74
- 103 Flowers solitary or twin. *Honeysuckles*.....CAPRIFOLIACEÆ. 71*
- 104 Ova. and caps. 2-celled, many-seeded. Sds. albuminous... SCROPHUL. 91*
- 104 Ova. and caps. 2-celled; sds. few, on hooks, without album. ACANTHACEÆ. 90
- 104 Ova. 1—4-seeded, entire, separat. into as many little nuts. VERBENACEÆ. 92
- 104 Ovary deeply 4-lobed, forming 4 distinct achenia in fruit...LABIATÆ. 93*
- 105 Fls. with corona or crown, in umbels. *Silk-grasses*. ASCLEPIADACEÆ. 102*
- 105 Flowers with no corona, in cymes. *Dogbanes*.....APOCYNACEÆ. 101*
- 106 Leaves alternate....112
- 106 Leaves opposite....107
- 107 Ovary superior....109
- 107 Ovary inferior....108
- 108 Stipules present. Stamens 4. Flowers in globose heads. RUBIACEÆ. 72*
- 108 Stipules (mostly) none. Stamens 5. *Honeysuckles*...CAPRIFOLIACEÆ. 71*
- 109 Fls. irregular. Perfect stamens 2 or 4. *Bignoniads*....BIGNONIACEÆ. 88
- 109 Flowers regular....110
- 110 Sta. 10, twice as many as the corolla lobes. *Heathworts*....ERICACEÆ. 78*
- 110 Stamens 5, as many as the corolla lobes. *Dogbanes*...APOCYNACEÆ. 101*
- 110 Stamens 2, fewer than the corolla lobes....111
- 111 Corolla imbricate and twisted in the bud. *Jasmines*...JASMINACEÆ. 103
- 111 Corolla valvate in the bud. *Oliveworts*. *Ash*.....OLEACEÆ. 104
- 112 Ovary superior....114
- 112 Ovary inferior....113

- 113 Flowers in an involucre head—compound.....COMPÓSITÆ. 75*
 113 Fls. in racemes, &c. Stamens distinct. Fruit a berry...ERICACEÆ. 78*
 113 Fls. in racemes, &c. Sta. united. Fr. a winged drupe. STYRACACEÆ. 81
 114 Stamens (hypogynous) inserted *with* the cor. *Heathworts*..ERICACEÆ. 78*
 114 Sta. (perigynous) inserted on the top of the cor. tube...DIAPENSIACEÆ. 97
 114 Stamens (perigynous) inserted on the corolla tube inside....115
 115 Stamens twice as many as the petals, all perfect.....EBENACEÆ. 80
 115 Sta. twice as many as the petals, half of them sterile....SAPOTACEÆ. 83
 115 Stamens as many as the petals (lobes of the corolla)....116
 116 Drupe with 3—6 one-seeded cells. *Hollyworts*.....AQUIFOLIACEÆ. 79
 116 Berry or pod 00-seeded. Lvs. not decurrent. *Nightshades*. SOLANACEÆ. 99*
 116 Pod 2-celled, 00-seeded. Leaves alternate. *Mullein*. SCROPHULARIACEÆ. 91*

Orders of the Apetalous Exogens.

- 117 Herbs....(Stem endogenous, flowers on a spadix....164)....118
 117 Trees, shrubs, and under-shrubs....131
 118 Leaves alternate or all radical....119
 118 Leaves opposite....124
 119 Stipules sheathing above the nodes. *Knot-grasses*....POLYGONACEÆ. 110*
 119 Stipules conspicuous, serrate, but not sheathing the stem....35
 119 Stipules 0, or if present, not sheathing nor serrate....120
 120 Fruit a berry, 10-carpled and 10-seeded. *Garget-poke*. PHYTOLACCACEÆ. 111*
 120 Fr. 3-carpl'd, 3-sdd, split'ng into 3 nutlets. *Spurgeworts*. EUPHORBIACEÆ. 121
 120 Fruit 4-seeded. Calyx none. Stamens 7. *Lizard-tail*...SAURURACEÆ. 117
 120 Fruit many distinct achenia....13
 120 Fruit capsular, 3—6-celled, many-seeded....121
 120 Fruit a solitary 1-celled, 1-seeded utricle....122
 121 Fls. with a lurid-colored cal. of 3 sep. *Birthworts*. ARISTOLOCHIACEÆ. 105
 121 Flowers with a yellowish-green calyx of 5 sepals....31
 121 Fls. green, of 2 or 3 bracts under water. *Threadfoot*. PODOSTEMIACEÆ. 120
 122 Sep. white, connected to the anth. by threads. *Comandra*. SANTALACEÆ. 113
 122 Sepals dry and scarious, with scarious bracts around.. AMARANTACEÆ. 108
 122 Sepals green, minute....123
 123 Flowers perfect. *Chenopods*. *Pig-weeds*.....CHENOPODIACEÆ. 106

- 123 Flowers monoecious or dioecious. *Nettleworks*.....URTICACEÆ. 130
- 124 Stipules present. *Nettleworks*.....URTICACEÆ. 130
- 124 Stipules none....125
- 125 Flowers with a calyx only....126
- 125 Flowers with neither calyx nor corolla....130
- 125 Fls. with a color'd invol. Pod 3-s'ded *Spurgeworks*. EUPHORBIACEÆ. 121
- 126 Stamens numerous, indefinite. Sepals colored....13
- 126 Sta. 10, calyx green, with a 1-seeded utricle. *Knowel*. SCLERANTHACEÆ. 107
- 126 Stamens 1, 3, 4, 5, 8....127
- 127 Cal. large, colored, funnel-form, limb entire. *Four-o'clock*. NYCTAGIN. 109
- 127 Calyx small, limb 3—5-lobed....128
- 128 Ovary inferior, 1—4-celled, 1—4-seeded....32
- 128 Ovary inferior, 1-celled, many-seeded....31
- 128 Ovary superior, or free....129
- 129 Capsule 1-celled, 5-seeded, calyx colored....101
- 129 Capsule 1-celled, many-seeded, calyx green....50
- 129 Utricle 1-seeded, calyx dry, with dry, colored bracts. AMARANTACEÆ. 108
- 130 Leaves verticillate. Ovary 1-seeded. *Hornworks*. CERATOPHYLLACEÆ. 118
- 130 Leaves opposite. Ovary 4-seeded. *Water Starworks*. CALLITRICHACEÆ. 119
- 131 Leaves alternate....132
- 131 Leaves opposite. Flowers not in catkins....139
- 132 Stipules present, often soon falling off....133
- 132 Stipules none....140
- 133 Juice milky. *Mulberryworks*. *Osage Orange*.....URTICACEÆ. 130
- 133 Juice watery, &c....134
- 134 Flowers not in catkins; mostly perfect and with a calyx....135
- 134 Flowers in catkins, not perfect....136
- 135 Ova. inferior. Pod 3—6-celled. Shrubs. *Birchworks*. ARISTOLOCHIACEÆ. 105
- 135 Ovary superior. Fruit 1-seeded. Trees. *Elmworks*....ULMACEÆ. 116
- 135 Ovary superior. Fruit 3 or 4-seeded, nutlike....68
- 136 Aments pistillate and staminate, globular and pendulous. Trees..138
- 136 Aments pistillate and staminate, cylindric and oblong....137
- 137 Ovary 1-celled, 1-ovuled, fruit 1-seeded. *Galeworks*....MYRICACEÆ. 126
- 137 Ovary 2-celled, 2-ovuled, fruit 1-seeded. *Birchworks*..BETULACEÆ. 125*
- 137 Ovary many-ovuled, fruit many-seeded. *Willowworks*..SALICACEÆ. 127

- 138 Fr. 2-celled, several-seeded. *Liquidambar*. *Sweet gum*... BALSAMIF'ERÆ. 128
 138 Fruit a 1-seeded, club-shaped nut. *Sycamores*..... PLATANACEÆ. 129
 139 Samara double, winged.... 62
 139 Samara single, winged.... 111
 139 Achenia enclosed in the berry-like calyx. *Oleasters*. ELEAGNACEÆ. 115
 139 Pod of 3, 1-seeded, slightly-united nuts. *Box*..... EUPHORBIACEÆ. 121
 140 Fruit 1-celled. Ovary 1—2-ovuled.... 141
 140 Fr. 3—9-celled. Fls. ♀. Evergreen shrubs. *Crowberries*. EMPETRACEÆ. 123
 141 Both ♀ and ♂ fls. in oblong aments. Shrubs..... MYRICACEÆ. 126
 141 Only the staminate flowers in aments. Trees.... 143
 141 None of the flowers amentaceous.... 142
 142 Ova. inf. Fls. greenish. Drupe 1-seeded. *Sandalworts*... SANTALACEÆ. 113
 142 Ova. sup. Cal. tubular, yellow or white. Shrubs. *Daphnads*. THYMELÆ. 114
 142 Ovary superior. Calyx deeply cleft. Prickly shrubs.... 71
 142 Ovary sup. Calyx deeply cleft. Smooth shrubs. *Laurels*.... LAURACEÆ. 112
 143 Leaves pinnate. *Walnuts*. *Butternuts*..... JUGLANDACEÆ. 123
 143 Lvs. simple, straight-veined. *Mastworts*, *Oak*, &c... CUPULIFERÆ. 124

§§§§§ Orders of the Gymnosperms.

- 144 Stems branched. Lvs. simple. *Cónifers*, *Pine*, *Spruce*, &c... CONÍFERÆ. 131
 144 Stems simple. Leaves parallel-veined, pinnate. *Zamia*... CYCADEÆ. 132

§ Orders of the Aglumaceous Endogens.

- 145 Trees and shrubs.... 146
 145 Herbs.... 148
 146 Erect. Lvs. parallel-veined, fan-shaped, or pinnated. *Palms*... PALMEÆ. 133
 146 Climbing. Leaves net-veined, entire.... 147
 147 Fruit a thin, 3-cornered capsule. *Yam-roots*..... DIOSCOREACEÆ. 150
 147 Fruit a globose berry. *Sarsaparillas*. *Greenbriers*..... SMILACEÆ. 151
 148 Perianth complete, of 6 parts (or 4, white); never on a spadix.... 149
 148 Perianth complete; flowers obscure, in a dense, roundish head.... 166
 148 Perianth incomplete or none. Flowers mostly on a spadix.... 163

- 149 Perianth adherent to the ovary (in the perfect flowers).... 150
 149 Perianth free from the ovary.... 156
 150 Fls. monœcious or diœcious. Plants in water. *Frogbits*. HYDROCHARID. 139
 150 Flowers perfect. Plants terrestrial.... 151
 151 Flowers regular.... 153
 151 Flowers irregular.... 152
 152 Stas. 1—2, adhering to the pistil (gynandrous § 311, 20).. ORCHIDACEÆ. 140*
 152 Stamens 1, with half an anther, free from the pistil. *S*.... CANNACEÆ. 144
 152 Stamens 3. *Irids*.—*Gladiolus*. *Corn-flag*..... IRIDACEÆ. 149*
 153 Stamens 3.... 154
 153 Stamens 6.... 155
 154 Anth. opening inward (toward the pist.). Lvs. none. *S*. BURMANNIACEÆ. 141
 154 Anth. opening inward. Lvs. sword-shap'd (ensiform). HEMODORACEÆ. 148
 154 Anthers opening outward (toward the perianth). *Irids*.... IRIDACEÆ. 149*
 155 Petals and sepals similarly colored. *Amaryllids*.. AMARYLLIDACEÆ. 147*
 155 Petals and sepals unlike in color. *S. Long Moss*.... BROMELIACEÆ. 146
 156 Petals and sepals similarly colored.... 157
 156 Petals and sepals dissimilarly colored... 162
 157 Styles or sessile stigmas united into 1.... 159
 157 Styles and stigmas 3, distinct.... 158
 158 Fruit a berry. Leaves net-veined, petiolate. *Green briers*... SMILACEÆ. 151
 158 Fruit a pod, 00-seeded. Lvs. parallel-v'ned. *Melanths*. MELANTHACEÆ. 155*
 158 Fruit splitting into 1—2-seeded parts. Lvs. rush-like... ALISMACEÆ. 138*
 159 Perianth colored, succulent and withering.... 160.
 159 Perianth green, dry, or if colored scarious. *Rushworts*... JUNCACEÆ. 156
 160 Flowers regular, hexandrous.... 161
 160 Fls. irr., or triandrous. Water plants. *Pickereel Weeds*.. PONTEDRIACEÆ. 154
 161 Perianth woolly or scurfy outside, tubular..... HEMODORACEÆ. 148
 161 Perianths smooth outside, mostly 6-parted. *Lilies*..... LILIACEÆ. 153*
 162 Styles or stigmas 3. Leaves net-veined. *Trilliads*.... TRILLIACEÆ. 152*
 162 Style and stig. 1. Lvs. parallel-veined. *Spiderworts*.. COMMELYNACEÆ. 157
 162 Styles many. Leaves somewhat net-veined..... ALISMACEÆ. 138*
 163 Plants terrestrial.... 164
 163 Plants growing in water.... 165

- 164 Spadix with a spathe, or on a leaf-like scape. *Arads*.....ARACEÆ. 134*
- 164 Spadix ? with no spathe and not on a scape. *Typhads*...TYPHACEÆ. 136
- 165 Rt. floating in water. Plant on the surface. *Duckmeats*...LEMNACEÆ. 135
- 165 Root fixed in the mud. Plants submersed. *Naiads*....NAIDACEÆ. 137
- 166 Petals conspicuous, yellow. *Xyrids*.—*Xyris*.....XYRIDACEÆ. 158
- 166 Pet. inconspicuous, white. *Pipeworts*.—*Eriocaulon*. ERIOCAULONACEÆ. 159

Orders of the Glumaceous Endogens.

- 167 Stems mostly solid. Sheaths of the lvs. entire. *Sedges*...CYPERACEÆ. 160
- 167 St. mostly hollow. Sheaths split to the joints. *Grasses*....GRAMINEÆ. 161

THE FLORA:

OR, SELECTIONS FROM THE NATIVE AND CULTIVATED

PLANTS OF THE UNITED STATES.

DESIGNED AS FIRST EXERCISES IN ANALYTICAL BOTANY.

EXPLANATIONS. The Tables in this work are designed to be *complete*; that is, each Ordinal Table includes *all* the Genera belonging to that Order known in the United States, east of the Mississippi River; and each Generic table includes, in like manner, *all* its known species. The numbers annexed to the Genera in the Ordinal Tables refer to the descriptions immediately following. If no number be annexed, the pupil will understand that that Genus is not further noticed.

CHAPTER I.

OF THE POLYPETALOUS EXOGENS.

Essential Character.—Flowering plants (PHÆNOGAMIA) with their stems growing by additions to the outside in layers (EXOGENS), their seeds enclosed in a seed-vessel or pericarp (ANGIOSPERMS), their flowers with a double perianth, and their petals distinct (POLYPETALÆ). (But to this last condition there are some exceptions.)

ORDER I. RANUNCULACEÆ.—CROWFOOTS.

Herbs, rarely *shrubs*, with a colorless, acrid juice, with *leaves* mostly alternate and much divided, without stipules, *sepals* 3—15, deciduous, distinct, and colored when apetalous, *petals* 3—15, distinct, often deformed or contracted, or wanting, *stamens* 00, distinct, hypogynous—ovaries 00 (rarely 1 or few), distinct,
fruit either achenia, or follicles, or berries, and the seeds with a minute embryo at the end of fleshy albumen.

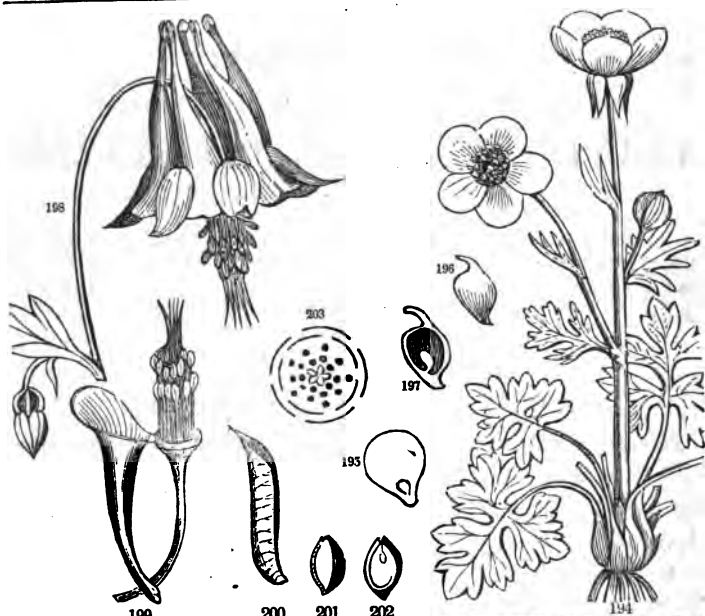


Fig. 194, *Ranunculus bulbosus*. 195, a petal, showing the honey scale at base. 196, a single ovary. 197, section of it, showing the ovule. 198, *Aquilegia Canadensis*. 199, one of the hollow petals attached to the receptacle with the stamens and styles. 200, a ripe follicle. 201, a seed; 202, section of it, showing the embryo. 203, plan of the flower.

ANALYSIS OF THE GENERA GROWING IN THE U. STATES.

- 1 Leaves opposite.....2
- 1 Leaves alternate.....3
- 2 Sepals valvate (§ 346) in the bud. *Virgin's Bower*..... Genus CLEM'ATIS. 1
- 2 Sepals imbricate (§ 349) in the bud. *Wind-flower*..... ANEMO'NE. 2
- 3 Flowers regular....5
- 3 Flowers irregular....4
- 4 Upper sep. hooded, covering the 2 deformed pet. *Monk's-hood*... ACONIT'UM. 3
- 4 Upper sepal and petals spurred behind. *Larkspur*..... DELPHIN'IUM. 4

- 5 Sepals green.....6
 5 Sepals colored and petal-like....9
 6 Leaves all radical....7
 6 Leaves radical and cauline....8
 7 Leaves 3-lobed. *Noble Liverwort*.....HEPAT'ICA. 5
 7 Leaves linear. Plant very small. *Mouse-tail*.....MYOSU'RUS.
 8 Styles many, achenia in fruit. Sepals deciduous. *Crowfoot*. RANUN'CULUS. 6
 8 Styles 2—5, pods, or follicles in fruit. Sepals persistent. *Piny*....PEO'NIA.
 9 Petals none....10
 9 Petals present....13
 10 Fruit several follicles....11
 10 Fruit many achenia....12
 10 Fruit a red, compound berry. *Orange-root*.....HYDRAS'TIS.
 11 Flowers yellow, leaves reniform. *Marsh Marigold*.CALTHA. 7
 11 Flowers white, leaves compound.....ISOPT'URUM.
 12 Leaves palmately lobed, large. Stem tall. *Prairies, W.* TRAUTVETTE'RIA.
 12 Leaves twice or thrice ternate. *Meadow Rue*.THALIC'TRUM.
 13 Stem shrubby, short. Fls. dark purp. *Yellow-Root*....ZANTHORH'ZA.
 13 Stems herbaceous....14
 14 Ovaries and fruit pod-like, several seeded....15
 14 Ovaries and fruit seed-like (achenia). Fls. crimson.....ADO'NIS. 8
 14 Ovary single and simple, in fruit a berry. *Cohosh*.....ACTE'A.
 15 Petals very small, 1-lipped, tubular at base. *Globe-flower*...TROL'LUS.
 15 Petals small, 1-lipped, tubular at the top. *Gold-thread*.....COP'TIS. 9
 15 Petals quite small, 2-lipped, tubular. *Hellebore*.....HELLEB'ORUS.
 15 Petals larger than the sepals, spurred behind. *Columbine*..AQUILE'GIA. 10
 15 Petals small, stamen-like, flat, 2-horned at top. *Bugbane*..CIMICIF'UGA.
 15 Petals common size, flat, 3-lobed. *Fennel-flower*.....NIGEL'LA.

1 CLEM'ATIS. VIRGIN'S BOWER.

Calyx of 4 (rarely 5, 6 or 8) sepals, colored, pubescent. Corolla 0, or small and stamen-like. Filaments 00, shorter than the sepals. Ovaries 4—20. Styles becoming long and feathery upon the seed-like achenia.—4 Mostly climbing vines, with twisting petioles for tendrils, and with compound, opposite leaves.

- 1 Petals none, the sepals colored like petals....2
 1 Petals several, slender. Sepals large, purplish. Stem climbing, with ternate leaves in whorls of 4s. *E. N-E....C. VERTICILLARIA*.
 2 Stem erect, simple, with one terminal, nodding, large flower....3
 2 Stem climbing by the petioles, with several flowers....4
 3 Leaves undivided, ovate, entire, silky beneath. *S. M....C. OCHROLEUCA*.
 3 Leaves undivided, broad-ovate, smooth, glaucous beneath. *S...C. OVATA*.
 3 Leaves 3-cleft into linear lobes, or lance-ovate, entire. *S....C. BALDWINII*.
 4 Flowers solitary, large, purple. Leaves mostly pinnate....6
 4 Flowers in panicles, rather small, white. Leaves ternate....5
 5 Leaflets smooth, ovate, cut-toothed. Stem 10—16' long. *c....C. VIRGINIANA*.
 5 Leaflets downy, lance-oblong, entire. *S. Rare.....C. HOLOSERICA*.
 6 Sep. thick, not wavy, point narrow, reflexed. *M.S. W. Leather-fl. C. VIORIANA*.
 6 Sepals thickish, not wavy. Lfts. 9, oval, obtuse, veiny. *S. C. RETICULATA*.
 6 Sepals thickish, wavy at edge. Fls. long-bell-shaped. *S. C. CYLINDRICA*.
 6 Sepals thin, wavy and crisped. Fruit tails not feathery. *S.....C. CRISPA*.

2. ANEMONE. WIND-FLOWER.

Calyx regular, of 5—15 colored sepals. Petals none. Stamens 00, much shorter than the sepals. Ovaries 00, collected into a roundish or oblong head. Achenia generally without tails.—4 Leaves mostly radical, palmately divided, those of the stem opposite in whorls of 3, forming a sort of involucre.

- 1 Carpels without tails in fruit....2
 1 Carpels with long feathery tails. Lvs. cleft into lance-linear lobes, with long, soft hairs. *Mar. Ap. N-W. Rare. (Pasque-fl.) A. PATENS*.
 2 Stem leaves (involucre) sessile. Fls. white or bluish white....3
 2 Stem leaves petiolate....4
 3 Flower 1 only, with 15—20 sepals. Height 4'—12'. *S....A. CAROLINIANA*.
 3 Fls. 1—5, with 5 obovate sepals. Height 12'—20'. *N-W. A. PENNSYLVANICA*.
 4 Flower-stalks 1 or several, all leafless....5
 4 Flower-stalks 2—5, all (except the oldest one) 2-leaved in the middle....6
 5 Flower 1, its stalk 2' or 3' long. Sep. bluish-white. *Apr. c....A. NEMOROSA*.
 5 Fls. mostly several, whitish, on stalks 6'—12' long. *N.M.W. A. CYLINDRICA*.
 6 Leaf-lobes lance-ovate. Flowers whitish. Ht. 2—3f. *Com....A. VIRGINIANA*.
 6 Leaf-lobes linear. Flowers red. Ht. 6'—12'. *N. Rare.....A. HUDSONIANA*.

3. ACONITUM. MONK'S-HOOD.

Sepals 5, irregular, colored, upper one vaulted or hooded. Petals 5 or 6, the two upper on long claws, concealed beneath the upper sepal, recurved and honeyed at top; the other 3 or 4 very small.

Styles 3—5. Follicles 3—5.—4 Leaves palmately cleft or divided. Flowers odd and showy, in terminal spikes.

Stem weak, reclining, widely branched. Helmet conical. *M.S.* A. UNCINATUM.
Stem stout, erect, nearly simple. Helmet semi-circular. *Cult.†* A. NAPEL'US.

4. DELPHINIUM. LARK-SPUR.

Sepals 5, colored, the upper one spurred. Petals very irregular, the two upper ones extended behind into a tubular, honeyed spur, sheathed in the spur of the calyx. Styles 1—5. Follicles 1—5.—Showy herbs with the leaves much divided. Flowers blue, red, or purple, never yellow.

- 1 Species found wild in the country, often also in gardens....2
- 1 Species never wild in this country, but found in gardens (omitted).
- 2 Ovaries and pods 3—5. Petals separate. 2....3
- 2 Ovary and pod 1 only. Pet. united. Lvs. finely divided. ①...D. CONSOL'IDA.
- 3 Racemes long and slender, many-flowered....4
- 3 Racemes loose, few (6—12)-flowered....5
- 4 Leaf-lobes wedge-form. Flowers bright blue. *N. M. W.*...D. EXALTA'TUM.
- 4 Leaf-lobes linear. Spur ascending. Flowers azure. *S.*.....D. AZU'REUM.
- 5 Leaf-lobes linear. Spur straight. Pods wide-spread. *M. W.* D. TRICOR'NE.
- 5 Leaf-lobes lanceolate. Spur ascending. Fls. greenish. *S.*...D. VIRES'CENS.

5. HEPATICA. NOBLE LIVERWORT.

Calyx (generally called an involucre) of 3 entire, ovate, green sepals (or bracts), situated a very little below the corolla. Corolla of 5—9 petals, arranged in 2 or 3 rows. Achenia without tails.—4 Pretty little plants blossoming in early spring. Leaves all radical, thick, 3-lobed, green through the winter. Flowers numerous, one on each scape, blue, roseate, or white.

Leaf-lobes and sepals obtuse. Scape hairy, several inches high. *H. TRIL'LOBA.*
Leaf-lobes and sepals acute. Fls. and scapes like the other....*H. ACUTIL'LOBA.*

6. RANUNCULUS. CROWFOOT. BUTTER-CUPS.

Calyx of 5 ovate sepals. Corolla of 5 roundish, shining petals, each with a honeyed scale or pore at the base inside. Stamens 00. Achenia numerous, flattened, crowded in a roundish or oblong

head.—A large genus of herbs, mostly 4 and with yellow flowers. Leaves divided or entire. Juice very acrid.

- 1 Petals yellow. Seeds (carpels) roughened with prickles. Fls. small. *S.*...11
- 1 Petals yellow. Seeds smooth and even. *N.* & *S.*....2
- 1 Petals white (claws yellow). Seeds wrinkled crosswise....2
- 2 Leaves all undivided. Plants growing in wet places....6
- 2 Leaves more or less divided, not growing under water....3
- 2 Leaves in fine, numerous, thread-like divisions, growing under water....5
- 3 Root leaves neither divided nor cleft, merely crenate....7
- 3 Lower leaves 3-cleft, but not (divided) to the base. Height 1—2f.8
- 3 Leaves all ternately divided, and much cleft....4
- 4 Sepals reflexed in flower. Plants erect....9
- 4 Sepals spreading in flower, shorter than the petals....10
- 5 In ponds and rivers. The (white) pet. with a cavity at base. *R. AQUATILIS.*
- 5 In stagnant waters. The (yellow) petals with a scale at base. *R. PURSHII.*
- 6 Stems ascending (1—2f). Lvs. all lanceolate, narrow, entire...*R. FLAMMULA.*
- 6 Stems nearly erect (6'—12'). Lower leaves round-ovate.....*R. PUSILLUS.*
- 6 Stems creeping and rooting (4'—8'). Leaves lance-linear.....*R. REPTANS.*
- 6 Stems creeping and rooting (1f). Lvs. all round-cordate....*R. CYMBALARIA.*
- 7 Pl. hairy, bushy (4'—10'). Root leaves rhomb-ovate. *W.*...*R. RHOMBOIDES.*
- 7 Plant glabrous (1—2f). Root leaves round-cordate. *N. W.*...*R. ABORTIVUS.*
- 8 Stem hairy. Seeds with a straight beak, in a round head. *S.* *R. PALMATUS.*
- 8 Stem hairy. Seeds with a recurved beak, in a round head. *R. RECURVATUS.*
- 8 Stem glabrous. Seeds not beaked, in a cylindrical head....*R. SCELERATUS.*
Erect (6'—12') from a solid bulb. Pet. large. Hd. of fr. round. *R. BULBOSUS.*
- 9 Erect (1—3f), very hairy. Head of fruit oblong.....*R. PENNSYLVANICUS.*
- 10 Stems both creeping and ascending. Peduncles furrowed.....*R. REPENS.*
- 10 St. ascend. 4'—12'. Root fasciculate. Lvs. appear pinnate. *R. FASCICULARIS.*
- 10 St. erect, tall (2—3f). Leaf divisions all sessile. *Very com.* *N. M.*...*R. ACRIS.*
- 11 Sep. shorter than the pet., spread. Lvs. 3-lobed & cleft. *S.* *R. MURICATUS.*
- 11 Sep. long as pet., finally reflexed. Lvs. 3-lobed & cleft. *S.* *R. PARVIFLORUS.*

7. CALTHA. MARSH MARIGOLD.

Calyx colored, of 5 roundish sepals resembling petals. Corolla 0. Stamens 00. Follicles 5—10, oblong, compressed, erect, many-seeded.—4 Smooth marsh plants.

C. PALUSTRIS. (*Cowslips. Marsh Marigold.*) In wet meadows. Root large, thick. Stem about 1f high, hollow, round, branched. Leaves large (4—6' wide), roundish, cordate, crenate, lower on long, half-round petioles, upper sessile, all of a dark, shining green, and very smooth. Flowers of a golden yellow in all their parts, 1½' broad. Outer row of stamens club-shaped, long. *Apr. May.*

8. ADO'NIS. PHEASANT'S-EYE.

Sepals 5, colored. Petals 5—15, with no scale on the claws. Achenia in a spike, egg-shaped, and pointed with the hardened, persistent style.—Leaves numerous cleft into linear and very narrow segments. Flowers terminal, solitary, red or yellow.

A. AUTUMNALIS. A fine, hard annual, from Europe, cultivated in gardens, and naturalized in some places. Stem rather thick for its height, branched. Leaves pinnately parted, with very numerous segments. Petals 5—8, of a bright crimson color, 1½' across.

9. COPTIS. GOLD-THREAD.

Calyx of 5 or 6 oblong, colored sepals. Corolla of 5 or 6 small, club-shaped sepals, hollow and 1-lipped at top. Stamens 20—25. Follicles 5—10, stalked, beaked, spreading, 4—6-seeded.—4 Herbs with radical leaves and long, creeping root-stocks.

C. TRIFOLIA (*Gold-thread*). Leaves 3-foliate, all radical, the divisions broad, 4—8" long, crenate, smooth shining, sessile. Petiole 1—2' long. Stems under ground, creeping extensively, bright yellow, and very bitter. Peduncles 3—4' high, each 1-flowered. Calyx white. Petals yellow, much smaller than the sepals, barely distinguishable among the stamens by their color. *May. Mid. North.*

10. AQUILEGIA. COLUMBINE.

Sepals 5, ovate, colored, spreading. Petals 5, tubular with a wide mouth, the outer margin erect, the inner attached to the receptacle, and behind extended into a long, spurred nectary. Stamens 30—40, the inner ones longer and sterile. Styles 5. Follicles 5, many-seeded.—4 Leaves twice and thrice ternate. Flowers nodding.

Spurs straight, longer than limb. Sta. exserted. Fls. scarlet. C. CANADENSIS. Spurs incurved, shorter than limb. Sta. included. Fls. purple.† C. VULGARIS.

ORDER 2. MAGNOLIACEÆ.—MAGNOLIADS.

Trees and shrubs with membranous stipules sheathing the buds, with *leaves* alternate, leathery, simple entire or lobed, never serrate, *flowers* solitary, large and showy, mostly odorous and perfect, *sepals* 3—6, colored like the 6—12 hypogynous imbricated petals, *stamens* numerous, hypogynous, distinct, and many ovaries, *fruit* compound, composed of the united carpels, and with the *embryo* minute in the end of fleshy albumen.

ANALYSIS OF THE GENERA.

- 1 Carpels arranged in a cone....2
 1 Carpels whorled in a single row. *S.*..... *ILLICUM*.
 2 Anthers opening inward.....*MAGNOLIA*. 1
 2 Anthers opening outward..... *LIRIODENDRON*. 2

1. MAGNOLIA.

Sepals 3. Petals 6—9. Anthers longer than the filaments, opening inward. Carpels 2-valved, 1—2-seeded, imbricated into a hard, cone-like fruit. Seeds berry-like, suspended when ripe by a long seed-stalk.—A noble genus of trees or shrubs, with large, fragrant flowers.

- 1 Leaves acute at the base (not cordate)....2
 1 Leaves cordate or auriculate at the base. Trees 30—40f high....5
 2 Leaves shining above, white or rust colored beneath. Petals 9—12....3
 2 Leaves dull green both sides, thin, deciduous. Petals 6—9....4
 3 Tree evergreen, 60—70f high. Fls. 7'—8' broad. *S.*.... *M. GRANDIFLORA*.
 3 Shrub decid. (at the N.), 6—20f high. Fls. 2'—3' broad. *N. S. M. GLAUC.*
 4 Tree small. Fls. and lvs. large, ends of branches whorled. *M. S. M. UMBRÉLLA*.
 4 Tree large. Fls. small (3'—4' broad). Lvs. scattered. *M. S. M. ACUMINATA*.
 5 Petals yellow (6—9), with reddish lines. Fls. 5' broad. *S. M. CORDATA*.
 5 Petals white (9). Leaves ear-shaped at base. *S.*..... *M. FRASERI*.
 5 Petals white (6), a purple spot inside. Fls. 9' broad. *M. MACROPHYLLA*.

2. LIRIODENDRON.

Sepals 3. Petals 6, in two rows. Anthers opening outward. Carpels 1—2-seeded, imbricated into a cone, indehiscent, separating from each other in fruit.—Trees with large and fragrant flowers.

L. TULIPIFERA. (*Tulip tree. Whitewood. Poplar.*) This is one of the finest and largest trees of our forests. The trunk is generally straight and cylindric, dividing at the top rather abruptly in a few coarse and crooked branches. Leaves dark green, smooth, square at the end, with 2 lobes each side, 3—5' in length and breadth. Flowers large and brilliant, greenish yellow, orange within, 4—6' broad. *May. June.*

ORDER 6. BERBERIDACEÆ—BERBERIDS.

Herbs and shrubs, with alternate leaves and perfect flowers, with sepals imbricated in the bud in 2 or more rows, petals opposite the sepals, also imbricated in two or more rows, stamens opposite to the petals, having the anthers opening by 2 lids, ovary 1-celled, solitary and simple, forming a capsule or berry.

ANALYSIS OF THE GENERA.

Herbs with 12—18 stamens. *May Apple*..... PODOPHYLLUM. 1
Herbs with 8 stamens. *Twin-leaf. Rheumatism-root.*..... JEFFERSONIA.
Herbs with 6 stamens. *Cohosh. Pappoose-root.*..... LEONTICE.
Shrubs with yellow flowers and acid berries..... BERBERIS. 2

1. PODOPHYLLUM. MANDRAKE.

Sepals caducous. Petals 6—9, obovate, concave. Stamens 12—18, with linear anthers, the lids scarcely opening. Berry large, egg-shaped, 1-celled, crowned with the solitary stigma.—Low, somewhat poisonous herbs, with one or two leaves and one flower.

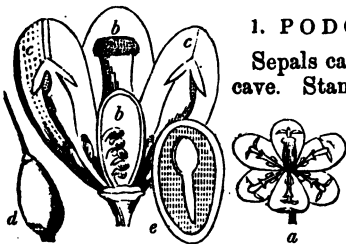


Fig. 204.—a, Flower of *Berberis vulgaris*; b, the pistil (magnified) with the ovary cut open; c, c, petals with stamens opposite; d, a berry; e, a seed cut open, showing the embryo.

P. PELTATUM. (*May Apple. Wild Mandrake.*) A singular and interesting plant, in woods and fields. Height about 1f. The barren plants bear but a single leaf, which is 5—8' broad, 5—7-lobed, and centrally peltate. The flowering plants have a pair of leaves, with the flower at the fork of the two petioles—the leaves not peltate, but with a deeply hollowed base, about 7-lobed. Flower drooping, white, about 2' across. Fruit yellowish, with the flavor of the Strawberry. *May.*

2. BER'BERIS.

Sepals 6, obovate, colored, the 3 outer ones smaller. Petals 6, roundish, with two glands at the base of each, inside. Stamens 6. Stigma sessile, disk-like, on the top of the ovary. Berry oblong, sour, 1-celled, 2—3-seeded.—Fine, hardy shrubs, with the wood, inner bark, and flowers yellow.

B. VULGARIS. (*Common Berberry bush.*) A well-known, bushy, handsome shrub, in hard soils. Grows 3—8f high. Leaves oval, near 2' long, rounded-obtuse at apex, tapering to a petiole, with bristly serratures on the margin. Flowers yellow, a dozen or more in each hanging raceme, with entire petals. Stamens irritable, springing against the stigma when touched. Berries red, very sour. *June.*

ORDER 8. NELUMBIA'CEÆ.—NELUMBO.

Herbs aquatic, prostrate root-stock and radical, peltate leaves, with *flowers* large, solitary, on long, upright scapes, 4 or 5-sepaled, *petals* numerous, arranged in many rows, as are also the many stamens, *ovaries* separate, each with a simple style and stigma, becoming in *fruit* 1-seeded nuts, half sunk in the hollows of the very large torus, the *seeds* with a very large embryo and no albumen.

NELUMBIUM.—NELUMBO.

The character of the genus the same as that of the order.

N. LUTEUM. (*Yellow Nelumbo.*) A magnificent flowering plant, frequent in the stagnant waters of the South and West, rare in N. Y. and Conn. The leaves are 1—2f broad, round, entire, peltate in the centre which is concave, and elevated above the water more or less on the long petioles. Flowers several times larger than the White Water Lily, but without fragrance. Petals concave, of a brilliant white at edge, becoming yellow toward the base. Nuts about as large as acorns, eatable. *June. July.* (See Frontispiece, Fig. 1.)

ORDER 9. NYMPHÆACEÆ.—WATER LILIES.

Herbs aquatic, with roundish leaves from a prostrate rhizoma.

Flowers large and showy, the sepals, petals, and stamens gradually passing into each other, imbricated and arranged in many rows.

Sepals few, colored inside, persistent. *Stigmas* radiating and crowning the *ovary* which in fruit becomes a capsule compound and 5-celled.

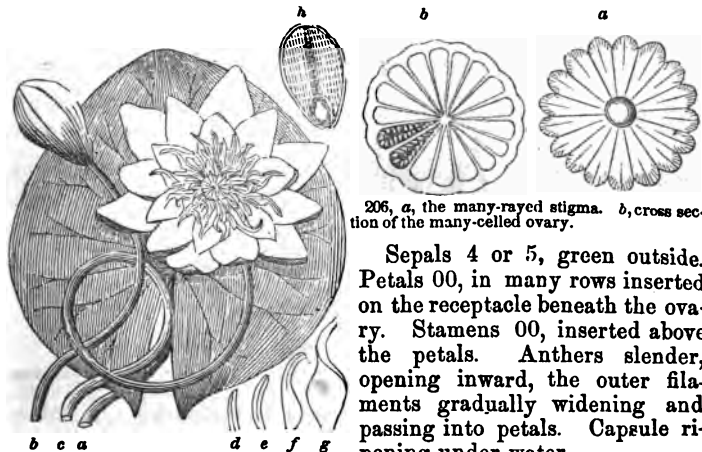
Seeds minute, numerous, with the embryo at the end of the albumen.

ANALYSIS OF THE GENERA.

Petals large as the sepals, white, red, or blue..... NYMPHÆA. 1

Petals smaller than the sepals, stamen-like, yellow..... NUPHAR.

1. NYMPHÆA.



206, *a*, the many-rayed stigma. *b*, cross section of the many-celled ovary.

Sepals 4 or 5, green outside. Petals 00, in many rows inserted on the receptacle beneath the ovary. Stamens 00, inserted above the petals. Anthers slender, opening inward, the outer filaments gradually widening and passing into petals. Capsule ripening under water.

Fig. 205, *Nymphaea odorata*. *a*, the leaf; *c*, the flower; *b*, the bud; *d*, *e*, *f*, *g*, stamens, gradually changing into petals; *h*, a seed cut open, showing the embryo in a little sack.

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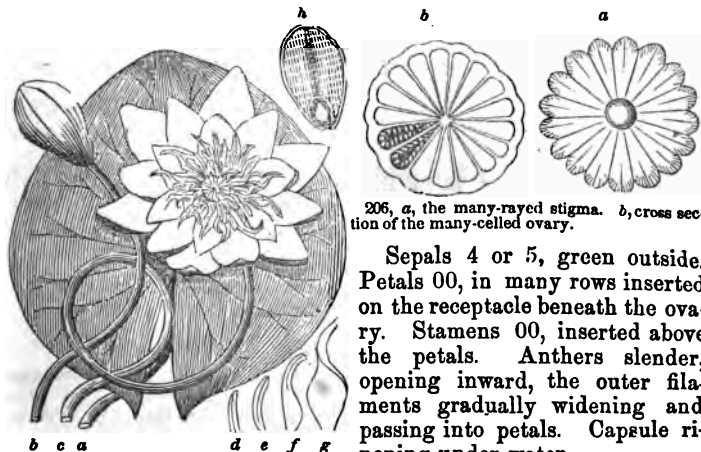
Sepals few, colored inside, persistent. *Stigmas* radiating and crowning the ovary which in fruit becomes a capsule compound and 5-celled.

Seeds minute, numerous, with the embryo at the end of the albumen.

ANALYSIS OF THE GENERA.

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 Petals smaller than the sepals, stamen-like, yellow..... NUPHAR.

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Fig. 206, *Nymphaea odorata*. *a*, the leaf; *c*, the flower; *b*, the bud; *d*, *e*, *f*, *g*, stamens, gradually changing into petals; *h*, a seed cut open, showing the embryo in a little sack.

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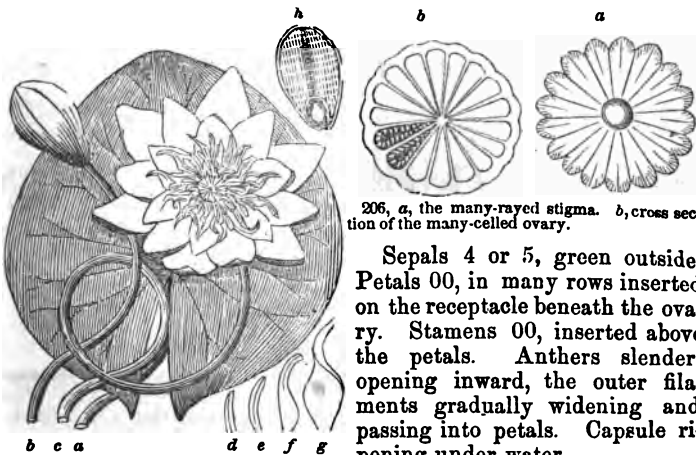
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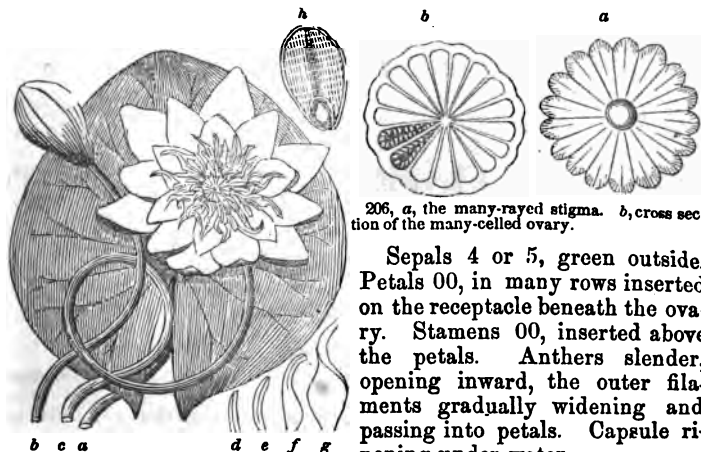
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- 1 Stem-leaves undivided. Flowers from *June* to *Sept.*...2
 1 Leaves all divided and lobed. Pods round. Gardens. *July.* L. SATIVUM.
 2 Pods round, wingless. Root-leaves pinnatifid, st.-lvs. toothed. L. VIRGINICUM.
 2 Pods roundish-oval, wingless. Petals 0. Stem-lvs. entire. W. L. RUDERALE.
 2 Pods ovate, winged, rough-scaly. Leaves arrow-shaped. W. L. CAMPÊSTRE.

5. SENEBIERÆ.

Silicle 2-lobed, appearing double. Valve somewhat turgid and indehiscent. Cells each with 1 roundish and 3-cornered seed.—Flowers white, in short racemes which stand opposite to the leaves.

S. PINNATIFIDA. A prostrate, weed-like plant, common at the South, in fields and on river-banks. Leaves divided in a pinnate manner, into oblong, toothed lobes. Flowers obscure, with scarcely any petals. Silicles flattened, notched at apex, wrinkled on the surface. *Feb.—July.*

6. DRABÆ.—WHITLOW-GRASS.

Calyx equal at base. Petals equal. Filaments without teeth. Silicle oval-oblong, entire, flattened parallel to the broad partition. Cells 2, many-seeded. Seeds not margined.—Low herbs, with small white or yellow flowers in racemes.

210. *Draba verna*.

211. A pod open.

- 1 Petals undivided. Stems more or less leafy...2
 1 Pet. 2-cleft. Lvs. small, all radical. Scapes 1'—6' high. *Mar. Apr.* D. VERNA.
 2 Pods of about the same length as their pedicels. *Apr. May*...3
 2 Pods longer than their pedicels. *March—June*...4
 2 Pods 3 times shorter than ped'ls, oval, in a long raceme. N-W. D. NEMORALIS.
 3 Lvs. lanceo., sharp-toothed. Pods lanceo., long-sty. M.W.S.D. RAMOSISSIMA.
 3 Lvs. round-ovate, upper ones lnr. Pods oval, short-styled. r. D. BRACHYPODA.
 4 Lvs. rnd-ovate, entire. Pds. lnr. in a sort of corymb. (1'—3') D. CAROLINIANA.
 4 Lvs. lanceo., sharp-toothed. Pods lance-oblong, short-sty. (8') D. ARABISANS.
 4 Lvs. wedge-obl. Pods lance-oblong, with no sty. (4'—8') W.S. D. CUNEIFOLIA.

7. ARABIS.—ROCK CRESS. SICKLE-POD.

Sepals erect. Petals clawed, entire. Silique linear, flattened.

valves one-veined in the middle. Seeds in a single row in each cell.—Flowers white.

- 1 Seeds winged with a broad margin. Pods curved, 3' long....2
- 1 Seeds almost or quite marginless. Pods 1'—2' long....3
- 2 Stem-lvs. narrowed to the base. Pods drooping. Smoothish...A. CANADENSIS.
- 2 Stem-leaves arrow-shaped. Pods spreading. Plant very smooth. A. LEVIGATA.
- 3 Stem-lvs. half-clasping by the cordate or sagittate base....4
- 3 Stem-lvs. narrowed to the base. Root-lvs. lyrate, pinnatifid....A. LYRATA.
- 4 Pods straight, very erect. Root-lvs. oblong-ovate, petiolate, hairy. A. HIRSUTA.
- 4 Pods straight, sprding. Rt.-lvs. obovate, obtuse, sharp-toothed. W. A. DENTATA.
- 4 Pods spreading and curved upward. Lvs. coarsely toothed. W. A. PATENS.

8. DENTARIA.—TOOTH-ROOT. PEPPER-ROOT.

Sepals converging or closed. Silique lanceolate, with flat, veinless valves opening elastically. Seeds in a single row in each cell, ovate, not bordered.—Plants 4. Stem a prostrate, jointed rhizoma. Stem leaves but 2 or 3. Flowers white or purplish.

- 1 Stem-leaves almost opposite or whorled....2
- 1 Stem-leaves alternate or scattered. Root-stock moniliform....3
- 2 Stem-lvs. 2 only, leaflets 3, ovate, toothed. Root-stock toothed. D. DIPHYLLA.
- 2 St.-lvs. 3, leaflets 3—5, linear, cleft. Rt.-stock a string of tubers...D. LACINIATA.
- 2 Stem-lvs. 2—3, numerously divided into linear leaflets. S....D. MULTIFIDA.
- 3 Leaflets 3, ovate, cut and cleft. Lvs. 3—7. Fls. purple. M...D. MAXIMA.
- 3 Lfts. 3, nearly entire; of the rt.-lvs. round-ovate, toothed. D. HETEROPHYLLA.

9. SISYMBRIUM.—HEDGE MUSTARD.

Calyx erect (or spreading in some species), equal at base. Petals clawed, entire. Silique terete or somewhat 4-angled. Valves concave. Style very short. Seeds ovoid, in a single row.

Leaves runcinate. Pods close-pressed to the stem. Fls. yellow. c...S. OFFICINALE.
Leaves oblong-obovate, a little toothed. Pods spreading. Fls. white. S. THALIANA.
Leaves twice pinnatifid, segments small. Pods wide-spread.....S. CANESCENS.

10. CARDAMINE.—BITTER CRESS.

Calyx a little spreading. Silique linear, with flat, veinless valves

which are narrower than the partition. Stigma entire. Seeds not margined, with a slender seed-stalk.—Flowers white.

C. HIRUTA. (*Pennsylvanian Cardamine*). A variable plant with small, white flowers, common every where in wet places. The plant is generally smooth, about a foot high. Leaves pinnate or lyrate-pinnatifid, leaflets 2–5 pairs, entire mostly, those of the root-leaves oval-oblong, of the cauline linear-oblong, the terminal one 3-lobed. Pods about 1' long, 12–18-seeded. *June*.

11. BARBAREA.—WINTER CRESS.

Sepals erect, nearly equal at base. Silique columnar, 2–4-cornered. Valves concave or keel-shaped by means of a strong central vein. Seeds in a single row.—Leaves lyrate-pinnatifid. Flowers yellow.

B. VULGARIS. (*Winter Cress*). Common in old fields, also brook-sides. Whole plant glabrous. Stem 1–2½ high, branching above. Leaves lyrate with the terminal lobe roundish, upper leaves obovate, pinnatifid at base, crenate, or repand dentate—all dark green, shining. Flowers showy, in racemes. Pods obscurely 4-cornered, slender, ½' long, curved upward. *May. June. 4.*

12. ERYSIMUM.—FALSE WALL-FLOWER.

Calyx closed. Silique linear, 4-sided. Stigma capitate. Seeds in a single row in each cell.—Mostly ②. Flowers yellow.

Stem ascending. Fls. small. Pods spreading, 1' in length. *M. E. CHEIRANTHOIDES.* Stem strictly erect. Fls. large (½' broad). Pods 2–3' long. *W. E. ARKANSANUM.*

13. SINAPIS.—MUSTARD.

Sepals spreading. Petals ovate, with straight claws. Silique nearly terete, valves 3-veined. Style short. Seeds in a single row, globular.—① or ②, with yellow flowers.

Upper lvs. lance-linear, entire. Pods 4-cornered, smooth. (*Black*). *S. NIGRA.* All the lvs. repand-toothed. Pods torose, smooth. (*Field M.*) *S. ARVENSIS.* All the lvs. lyrate-pinnatifid. Pods bristly, shorter than beak. (*White*). *S. ALBA.*

ORDER XVI. POLYGALACEÆ.—MILKWORTS.

Plants without stipules, bearing very irregular flowers ;
stamens 4–8, diadelphous. Anthers opening at the top, 1-celled,
fruit a flattened, 2-celled, 2-seeded capsule, free from the calyx.

POLYG'ALA.—MILKWORT.

Sepals 5, persistent, 2 of them (wings) wing-shaped and colored. Petals 3, the lower one boat-shaped, and often tipped with a crest. Stamens united by the filaments into a split sheath, or into 2 sets, cohering more or less with the claws of the petals. Fruit a small 2-celled, 2-seeded capsule, flattened on the sides and notched on the top. Seeds with an appendage at one end.—Low, bitter herbs (sometimes shrubs) with simple, entire leaves, sometimes bearing under-ground flowers.



Fig. 212. *Polygala polygama* (Bitter Polygala): a, the radical flowers. 213. *Polygala paucifolia*, two leaves and a flower. f, the crest on the lower petal: e, the stamens in 2 sets and the style seen beneath the hooded lower petal: d, the ovary: c, the style.

- 1 Leaves all alternate and scattered....2
- 1 Leaves whorled, at least the lower ones, in 4s or 5s....9
- 2 Flowers in ovate or oblong, obtuse, thick spikes....3
- 2 Flowers few, or in racemes, or in a slender, acute spike....11
- 3 Flowers white, or reddish, or purple....4
- 3 Flowers yellow or yellowish green....8
- 4 Calyx wings as long as or longer than the petals....5
- 4 Calyx wings much shorter than the petals....7
- 5 Leaves linear and very narrow....6
- 5 Lvs. linear-oblong. Spikes obtuse, the broad wings imbricate. *P. SANGUINARIA*.
- 5 Lvs. lanceolate. Wings much longer than the petals. *S.*...*P. BALDWINII*.
- 6 Spikes rather loose, $\frac{1}{4}$ ' thick, bright purple, obtuse.....*P. FASTIGIATA*.
- 6 Spikes quite close, $\frac{1}{4}$ ' thick, greenish purple, acutish.....*P. NUTTALLII*.
- 7 Lvs. linear-awl-shaped. Corolla with a showy crest. *S.W.*...*P. INCARNATA*.
- 7 Lvs. none, or merely short bristles. Corol. crested, tube short. *S.*...*P. SETACEA*.

- 8 Spikes few, solitary, orange-yellow, $\frac{1}{4}$ ' thick, St. 1f high. *M.S.*....*P. LUTEA.*
 8 Spikes few, solitary, yellowish-green, $\frac{1}{4}$ ' thick. St. 1'—4' high. *S.*...*P. NANA.*
 8 Spikes in a compound cyme, straw-yellow. St. 1f high. *S.*...*P. CYMOSA.*
 9 Spikes slender, tapering, acute, long-stalked....10
 9 Spikes oblong, obtuse, thick, sessile. Cal. wings acuminate..*P. CRUCIATA.*
 9 Spikes oblong, obtuse, loose, stalked. Wings acute. *M.S.*...*P. BREVIFOLIA.*
 10 Lvs. linear, nearly all whorled. Fls. close. Wings round. *P. VERTICILLATA.*
 10 Lvs. linear, the lowest whorled. Fls. scatter'd. Wings oval. *S.W.* *P. AMBIGUA.*
 10 Lvs. lance-obovate. St. 1—2f high. Wings round-obovate. *S.*...*P. BOYKINII.*
 11 Flowers spiked, white. Leaves lanceolate. Stem 1f high.....*P. SÉNÉGA.*
 11 Fls. racemed, purple, large. Lvs. lance-ovate. St. 1f. *S.*...*P. GRANDIFLORA.*
 11 Fls. racemed, purple (radical fls. white). Lvs. linear-oblong. *P. POLYGAMA.*
 11 Fls. 2 or 3, purple, large (radical fls. white). Lvs. ovate....*P. PAUCIFOLIA.*

ORDER 17. VIOLACEÆ.—VIOLETS.

Herbs with simple (often cleft), alternate leaves with stipules.

Flowers irregular, spurred, with the sepals, petals and stamens in 5s.

Cor. spurred at base. *Anth.* united: 2 of the filaments appendaged.

Style 1, with a one-sided stigma. *Capsule* 1-celled, 3-valved.

Seeds many, with the embryo nearly as long as the albumen.

ANALYSIS OF THE GENERA.

- Sepals unequal, with ear-shaped lobes at base.....*VIOLA.* 1
 Sepals nearly equal, not appendaged at base*SOLEA.*

1. VIOLA.—VIOLET.

Sepals 5, prolonged at base into two auriculate lobes. Petals more or less unequal, the largest one spurred at base, the 2 opposite ones at the sides equal, the 2 upper ones all equal. Stamens cohering by their anthers, 2 of them spurred at base. Seeds attached to the valves of the capsule.—Low herbs, caulescent or acaulescent. Peduncles angular, solitary, 1-flowered, nodding at the top.

- 1 Species growing wild, in fields and woods....2
 1 Species cultivated in gardens, not native....12
 2 Acaulescent: Leaves and flowers all radical....3
 2 Caulescent: stems leafy....8

- 3 Flowers blue....5
 3 Flowers white....4
 3 Fls. yellow. Lvs. roundish-ovate, cordate. *N. M.*..... *V. ROTUNDIFOLIA*.
 4 Lvs. reniform or roundish cordate. Petals beardless. *N. M.*..... *V. BLÁNDÁ*.
 4 Leaves oblong or ovate, abrupt at base. Petals a little bearded..... *V. PRIMULÉFOLIA*.
 4 Leaves lanceolate, tapering into the petiole. Petals beardless..... *V. LANCEOLÁTA*. *b*
 5 Lvs. deeply 5—9-lobed and cleft....7
 5 Leaves roundish, deeply cordate at base....6
 5 Leaves lance-ovate, abrupt and often cut-toothed at base..... *V. SAGITTÁTA*.
 6 Petals almost beardless. Spur very short. Mountains..... *V. PALÚSTRIS*.
 6 Petals beardless. Spur as long as the petals. *N. M.*..... *V. SELKÍRKII*.
 6 Petals densely bearded. Spur short. Leaves rolled in at the base.... *V. CUCULLÁTA*.
 7 Petals beardless. Leaves with linear divisions..... *V. PEDÁTA*. *m*
 7 Petals bearded. Leaves with linear divisions. *W.*..... *V. DELPHINIFOLIA*.
 7 Petals bearded. Leaves with broad, angular divisions..... *V. PALMÁTA*.
 8 Flowers white, purple, or blue....10
 8 Flowers yellow. Stem leafy only at the top....9
 8 Flowers cream-color. Stipules fringe-toothed. Spur short..... *V. STRIÁTA*.
 9 Leaves very broadly cordate. Stipules large..... *V. PUBÉSCENS*.
 9 Leaves hastate, acute. Stipules small. Spur short. *M. S.*..... *V. HASTÁTA*.
 9 Leaves 3-parted. Lobes lanceolate, toothed. *S.*..... *V. TRIPARTITA*.
 10 Spur longer than the petals. Fls. pale. *N. M. W.*..... *V. ROSTRÁTA*.
 10 Spur shorter than the petals....11
 11 Stipules entire. Pet. whitish inside, purplish out..... *V. CANADÉNSIS*.
 11 Stipules fringe-toothed. Leaves round-cordate..... *V. MUHLENBÉRGII*.
 11 Stipules lyrate-pinnatifid, very large. Pet. bluish-white... *V. ARVÉNSIS*.
 12 Two of the petals purple, three yellow and white..... *V. TRICOLOR*.
 12 Petals colored alike, small, fragrant, stem roundish..... *V. ODORÁTA*.
 13 Petals colored alike, large, violet-purple. St. 3-cornered... *V. GRANDIFLÓRA*.

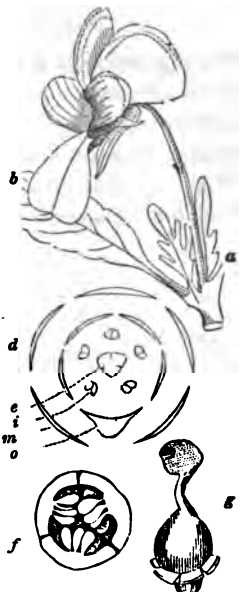


Fig 214. *Viola tricolor*. *a*, the stipules; *b*, a leaf; *c*, a flower; *d*, the plan of the flower; *e*, the ovary in the centre; *f*, the row of stamens; *g*, the petals (lower one spurred); *h*, the sepals; *i*, the ovary with the style and stigma; *j*, cross section of the 3-celled ovary.

ORDER 18. DROSERACEÆ.—SUNDEWS.

Herbs growing in bogs, often covered with glands, with *leaves* alternate, circinate (rolled from top to base) in the bud, *flowers* regular, of 5 persistent sepals and 5 withering petals, *stamens* 5, distinct and a single, compound *ovary*.

Styles 1—5, and *fruit* a 1—3-celled many-seeded capsule, and with *seeds* having a small embryo at the base of the albumen.

ANALYSIS OF THE GENERA.

Leaves	{	coiled (circinate) in the bud.	{ Stamens 5.....	DRÓSERÆ. 1
			{ Stamens 10—15.....	DIONÆ'A. 2
		not coiled in the bud.....		PARNÁSSIA. 3

1. DROSERÆ. SUNDEW.

Sepals 5, united at base, persistent. Petals 5. Stamens 5. Styles 3—5, each deeply 2-parted, so that there seems to be 6—10. Capsule 3—5-valved, 1-celled, many-seeded.—⁴ Small aquatic herbs. Leaves (all radical in the American species) clothed with long, reddish, gland-bearing hairs, exuding a clear, sticky fluid. Flowers in a raceme on a slender scape, which is at first coiled downward, but uncoils as the flowers open.

1 Flowers white, about $\frac{1}{4}$ ' across....2

1 Flowers purple or rose-color, $\frac{1}{4}$ ' across....3

2 Leaves round, on long, hairy stalks, spreading. *Common*. D. ROTUNDIFÓLIA.

2 Leaves wedge-oblong, on long, smooth stalks, half-erect....D. LONGIFÓLIA.

2 Leaves linear, obtuse, on slender, smooth stalks, erect. *N-W*...D. LINEÁRIS.

3 Lvs. broad-wedge-shaped, tufted, very short ($\frac{1}{4}$ '). *S*.....D. BREVIFÓLIA.

3 Lvs. very long (6'—8'), thread-like, erect. *F*ls. showy. *E*. D. FILIFÓRMIS.

2. DIONÆ'A. VENUS' FLY-TRAP.

Sepals 5, spreading. Petals 5, obovate, with pellucid veins. Stamens 10—15. Style 1. Stigmas 5, many-cleft. Capsule breaking irregularly in opening, 1-celled, many-seeded.—⁴ Glabrous herbs. Leaves all radical, sensitive, closing convulsively when touched. Scape umbelled.

D. MUSCIPULA. A very remarkable plant, in sandy bogs, at the South, sometimes cultivated. Leaves spreading, the petiole broadly winged, ending in a roundish blade which is fringed with spines, instantly closing upon insects which alight upon it. Scape 6—12" high, bearing an umbel of 8—10 white, handsome flowers. *Apr. May.*



Fig. 215. *Dionaea muscipula*, leaves, stem and flowers: *a*, the ovary with the style and stigmas; *b*, cross section of the ovary.



Fig. 216. *Hypericum perforatum* (Common St. John's-wort): *a*, stem, leaves and flowers; *b*, the stamens in 3 sets surrounding the ovary with 3 styles; *c*, cross section of the ovary.

3. PARNAS'SIA. GRASS-OF-PARNASSUS.

Sepals 5. Petals 5, inserted on the calyx (perigynous). Stamens also perigynous, in 2 rows, the outer row of numerous sterile filaments, united in 5 sets, the inner row of 5 perfect stamens. Stigmas 4, sessile. Capsule 4-celled. Seeds very numerous—4 Elegant herbs, with radical leaves and 1-flowered scapes.

1. *P. CAROLINIANA*. An exceedingly interesting plant, in wet meadows, &c. Leaves about 7-veined, broadly oval or ovate, radical ones on long stalks, cauline few, near the ground, sessile, clasping. Scape about 1½ high, bearing one flower at top, which is about 1' across. Petals marked with green veins. *July. Aug.*

ORDER 20. HYPERICACEÆ.—ST. JOHN'S-WORTS.

Herbs or shrubs with opposite, entire, dotted leaves, and no stipules. *Flowers* mostly yellow, in cymes. *Sepals* unequal, 4—5, dotted. *Petals* 4—5, twisted in the bud, dotted, and with the veins oblique. *Stamens* hypogynous, in 3 or more parcels. *Ovary* superior. *Style* 1. *Fruit* a capsule or berry, many-seeded.

ANALYSIS OF THE GENERA.

	{ Glands under the ovary 0.	HYPERICUM. 1
Petals and sepals 5. {	Glands under the ovary 3.	ELODÆA.
Petals and sepals 4.	Glands under the ovary 0.	A'SCYRUM.

1. HYPERICUM. ST. JOHN'S-WORT.

Sepals 5, connected at base, nearly equal, leaf-like. Petals 5, oblique. Stamens many (sometimes few and distinct), united into 3—5 parcels with no glands between them. Styles 3—5, either distinct or united at base. Capsule 1-celled, or 3—5-celled.—Herbs or shrubs, with branching stems, opposite, entire leaves and yellow flowers.

- 1 Stamens 25—100, more or less united into clusters....2
- 1 Stamens 5—20, not at all united....12
- 2 Styles and cells of the capsule 5 or more....6
- 2 Styles 3 (often united into 1), capsule 3-celled or 3-valved....3
- 3 Capsule completely 3-celled....4
- 3 Capsule 1-celled with 3 prominent seed-lobes (placentæ, § 326)....5
- 4 Herbs with the flowers dotted with black....8
- 4 Shrubs with the flowers not dotted....7
- 5 Stems wholly shrubby. Styles united into 1....9
- 5 Stems shrubby at base only. Styles united into 1....10
- 5 Stems wholly herbaceous. Styles distinct at least at the top....11
- 6 Herb with large fls. (2' broad). Lvs. lance-obl. Hight 3—4f. *H. PYRAMIDATUM*.
- 6 Shrub with fls. 1' broad. Lvs. lance-linear. Hight 1—2f. *M.N. H. KALMIANUM*.
- 7 Lvs. lance-oblong, obtusish. Shrub 2—4f. Fls. 1' broad. *S.W.H. PROLIFICUM*.
- 7 Lvs. lance-linear, appearing whorled. Fls. ½' broad. *S....H. GALIODES*.
- 7 Lvs. linear, petiolate, rolled at edge. Fls. ½' broad. *S.W.H. ROSMARINIFOLIUM*.
- 7 Lvs. linear, sessile, narrow, edge revol. Fls. ½' broad. *S. H. FASCICULATUM*.
- 8 St. 2-edged. Lvs. small, not black-dotted. Fls. 1' wide. *Com. H. CORYMBOSUM*.
- 8 St. terete. Lvs. large, black-dotted. Sty. as long as ovary. *Com. H. PERFORATUM*.
- 8 St. terete. All over black-dotted. Sty. twice as long as ovary. *S.H. MACULATUM*.
- 9 Fls. large (1½' broad), solitary, sessile. Lvs. thick, sessile. *S....H. AUREUM*.
- 9 Fls. in very leafy, compound cymes. Lvs. thick, clasping. *S.H. MYRTIFOLIUM*.
- 9 Fls. in the axils of the upper leaves. Lvs. thin, acute. *S....H. AMBIGUUM*.
- 9 Fls. in leafless cymes. Lvs. thick, opaque, obtuse. *S....H. CISTIFOLIUM*.
- 10 Cyme leafless. Lvs. oblong, obtuse. Caps. conic-ovoid. *M.S. H. NUDIFLORUM*.
- 10 Cyme leafless. Lvs. oblong-linear, obtuse. Caps. glob. *W. H. SPHEROCARPON*.
- 10 Cyme few-leaved. Lvs. lanceolate, acute, half-erect. *M.W. H. ADPRESSUM*.
- 10 Cyme few-leaved. Lvs. lance-linear, acute, spreading. *S. H. DOLABRIFORME*.
- 11 Herb rough-downy. Lvs. lance-ovate, erect. Stem terete. *S. H. PILOSUM*.
- 11 Herb smooth. Lvs. ovate, acute, erect. St. sharply square. *S.H. ANGULOSUM*.
- 11 Herb smooth. Lvs. elliptical, obtuse, thin. Stem square. *H. ELLIPTICUM*.
- 12 Lvs. ovate, clasping, 5-veined. Cymes leafy. Sta. 6—12. *Com. H. MUTILUM*.
- 12 Lvs. linear, black-dotted. Cymes leafless. Sta. 5—10. *Com. H. CANADENSE*.
- 12 Lvs. awl-shaped, minute. Fls. scattered, sessile. Stem wiry. *H. SAROTHTRA*.
- 12 Lvs. linear, narrow. Fls. scattered, stalked. Sta. 10—20. *W.S.H. DRUMMONDII*.

ORDER 23. CARYOPHYLLACEÆ.—PINKWORTS.

Herbs with the stems swelling at the nodes, opposite, entire *leaves*, *sepals* 4 or 5, sometimes distinct and sometimes united into a tube, *petals* 4 or 5 (sometimes 0) with or without claws, hypogynous, *stamens* generally twice as many as the petals, *styles* 2—5, *fruit* a 1-celled (rarely 2—5-celled) capsule with numerous seeds, and an *embryo* coiled around fleshy albumen.

ANALYSIS OF THE GENERA.

Calyx	{	not tubular.	{	Sty. 3	{	Petals 0. Capsule 3-celled.....	MOLLUGO. 1
	{	tubular.	{	Sty. 4	{	Petals 4, 5 or 0, entire. Pod 4 or 5-valved....	SAGINA.
	{	tubular.	{	Sty. 5	{	Petals 5, bifid. Pod opening by 10 teeth..	CERASTIUM. 2
	{	tubular.	{	Sty. 2	{	Calyx having 2—4 scales at base	DIANTHUS. 3
	{	tubular.	{	Sty. 3	{	Calyx having no scales at base.....	SAPONARIA.
	{	tubular.	{	Sty. 5	{	Capsule opening by 6 teeth	SILÈNE. 4
	{	tubular.	{	Sty. 5	{	Capsule opening by 5 or 10 teeth	LYCHNIS. 5

1. MOLLUGO. CARPET-WEED.

Sepals 5. Petals 0. Stamens 3—5, opposite to the sepals. Styles 3. Capsule 3-celled, 3-valved, many-seeded.—① Low or prostrate herbs, with the leaves appearing whorled.

M. VERTICILLATA. Stems slender, jointed, much branched, lying flat on the ground. At each joint stands a whorl of wedge-shaped or spatulate leaves of unequal size, usually about 5 in number, and a few flowers, each solitary on its stalk, which is shorter than the petioles. Flowers small, sepals white inside. In dry places. *July—Sept.*

2. CERASTIUM. MOUSE-EAR.

Sepals 5, ovate, acute. Petals 5, bifid or 2-cleft. Stamens 10, sometimes 5 or 4. Styles 5. Capsule cylindrical, or roundish, open-

ing at top by 10 tooth-like valves. Seeds numerous.—Flowers white, in cymes.

- 1 Petals about as long as the calyx. Plants hairy....2
- 1 Petals much longer than the calyx. Plants hairy or downy....3
- 2 Pale green. Lvs. obovate. Sep. acute. Fls. at first crowded. *C. vulgatum*.
- 2 Less pale, hairs sticky. Leaves lance-ovate. Sepals obtuse. *C. viscosum*.
- 3 In tufts. Lvs. linear. Ripe pods as long as the calyx. *N-E. C. arvense*.
- 3 Plant sticky. Lvs. lance-obl. Pods longer than cal. *M. C. oblongifolium*.
- 3 Erect, sticky. Ripe pods curved, thrice longer than cal. *N.W. C. nutans*.



Fig. 217. 1, *Lychnis diurna*; 2, the ovary divided, showing the free central placentæ, the 5 styles, &c.; 3, a petal; 4, cross section of the flower, showing the arrangement of its parts; 5, *Arenaria stricta*, showing the spreading cyme; 6, a flower enlarged, calyx not tubular.

3. DIANTHUS. PINK. CARNATION.

Calyx tubular, cylindrical, striate, with 2 or more pairs of opposite, imbricated scales at base. Petals 5, with long claws, limb unequally notched. Stamens 10. Styles 2, with revolute stigmas. Capsule cylindrical, 1-celled.

- 1 Bracts as long as the calyx tube....2
- 1 Bracts much shorter than the calyx....3
- 2 Bracts erect. Leaves linear. Cymes small, 3-flowered. *Wild... D. armeria*.
- 2 Bracts erect. Lvs. lanceolate. Cymes large, many-flowered.† *D. barbatus*.
- 2 Bracts spreading, leafy. Lvs. lance-linear. Fls. red, solitary.† *D. chinensis*.

- 3 Pet. crenate, beardless. Bracts round. Plant glaucous.† D. CARYOPHYLLUS.
 3 Pet. fringe-toothed, bearded. Bracts ovate. Plant glaucous.† D. PLUMARIUS.
 3 Petals fringe-pinnatifid, bearded. Bracts mucronate.†.....D. SUPERBUS.

4. SILE'NE. CATCH-FLY.

Calyx tubular, swelling, without scales at base, 5-toothed. Petals 5, 2-cleft, the claws often crowned with a stiff scale. Stamens 10. Styles 3. Capsule partly 3-celled, opening by 6 teeth at top.

- 1 Petals many-cleft and fringed. Flowers white or roseate. 2.....2
 1 Petals 2-cleft or 2-parted, white or whitish....3
 1 Petals 2-cleft, deep red. Root perennial. (2).....4
 1 Petals entire or merely notched....5
 2 Leaves whorled in 4s. Calyx inflated. Fls. large, white.....S. STELLATA.
 2 Leaves opposite. Calyx not inflated. Fls. white. S. rare.....S. OVATA.
 2 Leaves opposite, hairy, obovate. Fls. very large, roseate. S. S. BALDWINII.
 3 Calyx inflated and netted with veins. Pet. not crowned. N-E...S. INFLATA.
 3 Calyx inflated. Fls. few, large. Petals with a little crown. W. S. NIVEA.
 3 Calyx close on the pod. Fls. small, in a one-sided spike. ① S. NOCTURNA.
 3 Calyx close on the pod. Fls. stalked. Plant viscid-hairy. ① S. NOCTIFLORA.
 4 Lvs. spatulate. Fls. few, quite large (2' wide), crimson. S-W. S. VIRGINICA.
 4 Lvs. round, large (1'—2') broad. Fls. large, tooth., scarlet. W. S. ROTUNDIFOLIA.
 5 Flowers bright scarlet, large, panicle. Lvs. lance-ovate. 2 W. S. REGIA.
 5 Fls. white, small. Some of the upper joints sticky. ①....S. ANTIRRHINA.
 5 Fls. rose-purple. Stems clustered from a long 2 root. S. PENNSYLVANICA.
 5 Fls. rose-purple. Stem glaucous, from a small ① root.....S. ARMERIA.
 5 Flower purple, one only. Scape only 2' high. (Mrs., N. H.) 2 S. ACAULIS.

5. L'YCH'NIS. COCKLE. MULLEIN-PINK, &c.

Calyx tubular, 5-toothed, without scales at base. Petals 5, clawed. Stamens 10. Styles 5. Capsule 1-celled, or 5-celled at the base, opening at the top by 5 or 10 teeth. Petals sometimes crowned.

- 1 Petals broad, entire. Plants very hairy....2
 1 Petals 2-cleft, crowned with 2 scales at top of claw....3
 1 Petals gashed or 4-cleft. Plants nearly smooth....4
 2 Sepals longer than the crownless, purple petals. Lvs. linear...L. GITHAGO.
 2 Sepals shorter than the stiff-crowned petals. Lvs. broad†...L. CORONARIA.
 3 Fls. scarlet, in a crowded, compound cyme.† (Sweet Will.) L. CHALCEDONICA.
 3 Flowers light purple, in an open, loose cyme.† (See figure.)...L. DIURNA.
 4 Petals very broad, fringed with numerous teeth.† (Chinese)...L. CORONATA.
 4 Petals divided into 4 long teeth, crowned.† (Ragged Robin.) L. FLOSCUCULI.



Fig. 218. *Geranium Robertianum*, leaves, flowers and fruit; *a* fruit enlarged, showing one carpel on its elastic style; *b*, cross section of a seed, showing the large embryo filling the whole space *c*, the 10 stamens.

ORDER 27. GERANIACEÆ.—GERANIA.

Herbs or shrubby plants with the lower leaves opposite, with the *flowers* regular or irregular, terminal or opposite the leaves, with the *sepals* 5, persistent, and *petals* 5, clawed, twisted in the bud—the

stamens 10, monadelphous, and *pistils* 5, united—the carpels in *fruit* separating and bending upwards on the elastic style, each with one seed. Albumen 0.

ANALYSIS OF THE GENERA.

	{	Stamens 10, all of them perfect.....	GERANIUM. 1
Corolla		regular. { Stamens 5 perfect, 5 imperfect.....	ERODIUM.
		irregular. Stamens 7 perfect, 3 imperfect.....	PELARGONIUM.

1. GERANIUM.

Sepals and petals 5, regular. Stamens 10, all perfect. Fruit beaked, at last separating into 5, long-styled, 1-seeded carpels. Styles smooth inside, finally curling from the base upward, but still adhering at top to the axis.—Herbs with forked stems, much divided leaves, and 1-, 2- or 3-flowered peduncles.

1 Petals entire, twice as long as the awned sepals.... 2

1 Pet. notched or 2-lobed, short. Lvs. palmately 5—7-lobed. Pods hairy ①.... 3
2 Leaves palmately 5—7-parted. St. erect. Fls. large, purple. ② G. MACULATUM.

2 Lvs. pinnately 3-divided, lfts. 2-pinnatifid. Fls. small, ②.... G. ROBERTIANUM.

3 Sep. awned. Sd. netted on the surface. Lf.-lobes linear, 3-cleft. G. DISSECTUM.

3 Sep. awned. Sd. smooth. Lf.-lobes wedge-obl. 5—7-cleft. G. CAROLINIANUM.

5 Sep. awnless. Sd. smooth. Lf.-lobes linear, 3-cleft. *M. rare.* G. FUSILLUM.

Observation.—The pupil will perceive by the table above, that the parlor “geraniums” belong to the genus *Pelargonium*.

ORDER 31. OXALIDACEÆ.—WOOD SORRELS.

Low herbs with a sour juice, and alternate, compound leaves, with flowers regular and symmetrical, 5-sepaled and 5-petaled.

Stamens 10, monadelphous, hypogynous, the alternate ones longest.

Carpels 5, united and forming in fruit a 5-celled pod.

Seeds albuminous.

O X' A L I S.—WOOD SORREL.

Sepals 5, distinct or united at base, persistent. Petals much longer than the sepals. Stamens united at the base. Styles 5. Capsule roundish or pod-shaped, cells several-seeded.—Herbs mostly 2, with trifoliate leaves.

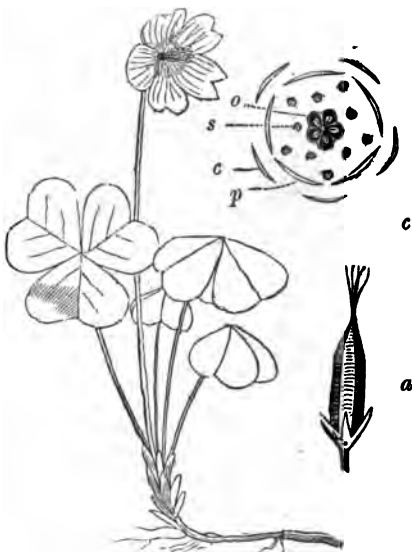


Fig. 219. *Oxalis Acetosella*. In the plan of the flower, *o*, the 5 carpels in the centre; *s*, the 10 stamens in two rows; *p*, the 5 petals; *c*, the 5 sepals; *a*, the ripe pod.

Fig. 219.

- 1 Stemless. Flowers white or purple....2
- 1 Stems leafy. Flowers yellow, few in an umbel....3
- 2 Scapes 1-fl. Fls. white, with purple veins. Rt.-stock creep. *O. ACETOSÉLLA*.
- 2 Scapes 2—6-flowered. Fls. violet-purple. Bulb scaly.....*O. VIOLÆCEA*.
- 3 Stem erect or ascending. Pet. entire, stalk longer than the lvs. *O. STRICTA*.
- 3 St. prostrate and rooting. Pet. obcord. Stalk shorter than lvs. *O. CORNICULATA*.

ORDER 37. MALVA'CEÆ.—MALLOWS.

Herbs, shrubs or trees with alternate, stipulate, divided leaves, with the flowers showy, axillary, regular, often with an involucre at the base, 5 sepals valvate and the 5 petals convolute in the bud, hypogynous, stamens indefinite and monadelphous, the anthers splitting across,

carpels several, united into a ring or forming a several-celled capsule, *seeds* with a curved embryo in a little albumen.

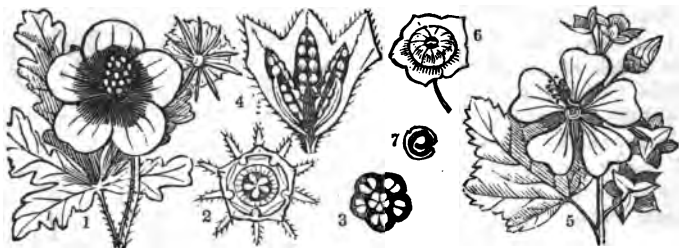


Fig. 220. 1, *Hibiscus Trionum*. (Flower-of-an-hour.) 2, Cross section of the flower, showing the arrangement of its parts. 3, Cross section of the 5-celled capsule. 4, Capsule open by its 5 valves. 5 *Malva sylvestris*. 6, Its fruit consisting of 10 carpels arranged in a circle. 7, Section of one of the carpels showing the curved embryo.

ANALYSIS OF THE GENERA.

	{ Carpels 00, 1-seeded.....	MALVA. 1
of 3 nearly distinct lvs.	{ Carpels 00, 2-seeded.....	MODIOLA.
of 3 united leaves.	Carpels numerous, 1-seeded....	LAVATÆRA.
	{ Carpels confused, 1-seeded....	MÁLOPE.
of 3 cordate leaves....	{ Capsule 3—5-celled.....	GOSYPPIUM. 2
	{ Carpels 00, dry, 1-seeded.....	ALTHÆA. 3
	{ Carp. 5, pulpy, 1-seeded..	MALVAVISCUS.
of 6—many leaves....	{ Capsule 5-celled, 00-seeded...HIBISCUS. 4	
	{ cells 3—6-seeded.....	ARUTILON.
Involucel { wanting. Carpels united, { cells 1-seeded.....		SIDA.

1. MALVA.

Calyx 5-cleft, with a 3-leaved involucl at its base. Carpels and styles numerous. Fruit cheese-form, separating when ripe into many one-seeded pieces, arranged circularly.

1 Flowers white or rose-colored....2

1 Flowers deep red or purple....3

2 Stem prostrate. Leaves round-cordate. Flowers small...*M. ROTUNDIFOLIA*.

2 Stem erect, tall. Lvs. abundantly crisped and curled.†.....*M. CRISPA*.

2 Sts. ascend., clustered. Lvs. deeply 5-part. Fls. large, showy.† *M. MOSCHATA*.

- 3 Erect, tall. Lvs. roundish, lobed. Petals obcordate.... *M. SYLVÉSTRIS*.
 3 Erect. Lvs. triangular-ovate. Pet. wedge-obovate. *N.-W. M. TRIANGULATA*.

2. *GOSSYPIMUM*. COTTON.

Calyx obtusely 5-toothed, surrounded by an involucl of 3 cordate, deeply-toothed leaves. Capsule 3—5-celled. Seeds involved in cotton.—Flowers yellow.

1 *G. HERBACEUM*. Stem annual, but woody, erect, about 5f high. Leaves 5-lobed, lower ones 3-lobed or entire, each with a large gland on the mid-vein beneath, $\frac{1}{4}$ from the base, and covered with dark dots. Involucels very large. Flowers very showy. Cotton white. *July*.

3. *ALTHÆA*. HOLLYHOCK, &c.

Calyx surrounded at base by a 6—9-cleft involucl. Carpels 00, 1-seeded, not opening, arranged circularly around the axia.

Lvs. downy, entire or 3-lobed. Fls. rose-col., stalked. *Marsh Mal. A. OFFICINALIS*.
 Lvs. rough-hairy, roundish, 5—7-lobed. Fls. sessile. (*Hollyhock*)... *A. ROSEA*.
 Lvs. hairy, deeply 7-parted. Fls. orange-colored. (*Figleaved Holl.*) *A. FICIFOLIA*.

4. *HIBISCUS*. MARSH MALLOW. FLOWER-OF-AN-HOUR, &c.

Calyx 5-cleft, surrounded by a many-leaved involucl. Styles united, stigmas 5, distinct. Fruit a 5-celled, 5—many-seeded capsule.—Flowers large, often nearly a foot broad.

- 1 Involucels 4—2-leaved. Herbs or shrubs....4
- 1 Involucels 10—15-leaved. Herbs only....2
- 2 Leaves ovate, mostly undivided....8
- 2 Leaves strongly 3—7-lobed....3
 - 3 Corolla rose-colored and purple in the centre, or scarlet....7
 - 3 Corolla sulphur-yellow, purple in the centre....6
- 4 Herbs. Corolla sulphur-yellow, purple in the centre....5
- 4 Herbs. Cor. purple, nodding. Pod with 1-seeded cells. *E. S. H. VIROGNICUS*.
- 4 Shrub 6—10f high. Corolla purple, varying to white, 3' long.† *H. SYRIACUS*.
- 5 Leaf-lobes linear, sub-entire; petiole shorter than the flower. *H. MANIHOT.*
- 5 Leaf-lobes shallow, obtuse; petiole longer than the flower. *H. ESCULÉNTUS*.
- 6 Calyx close, prickly-hispid. Bractlets 2-toothed. Very rough. *S. H. ACULEATUS*.
- 6 Calyx close, smooth. Bractlets entire. Lvs. hastate, 3-lobed... *H. MILITARIS*.
- 6 Calyx (in fruit) bladdery-inflated, hispid. Bractlets entire.†... *H. TRIUNUM*.
- 7 Corolla scarlet, 8'—16' broad. Leaf-lobes lance-linear.... *H. COCCINEUS*.
- 7 Corolla roseate, 10'—12' broad. Lvs. cordate, thick, large. *H. GRANDIFLORUS*.

- 8 Leaves white-downy beneath. Petals roseate, 4' long. *H. MOSCHÉUTO*.
 8 Leaves white-downy both sides. Petals sulphur-color, 4' long. *H. INCANUS*.
 8 Leaves smooth both sides. Petals purple, 4' long. *S-E.* *H. CAROLINUS*.

ORDER 42. ACERACEÆ.—MAPLES.

Trees or shrubs with opposite, usually simple palmate-veined leaves, the *flowers* often imperfect with the 5 sepals imbricated in the bud, and the *petals* 5, hypogynous, sometimes 0, the *stamens* mostly 8, and the *fruit* a *double samara*, with two opposite wings, 2-seeded.

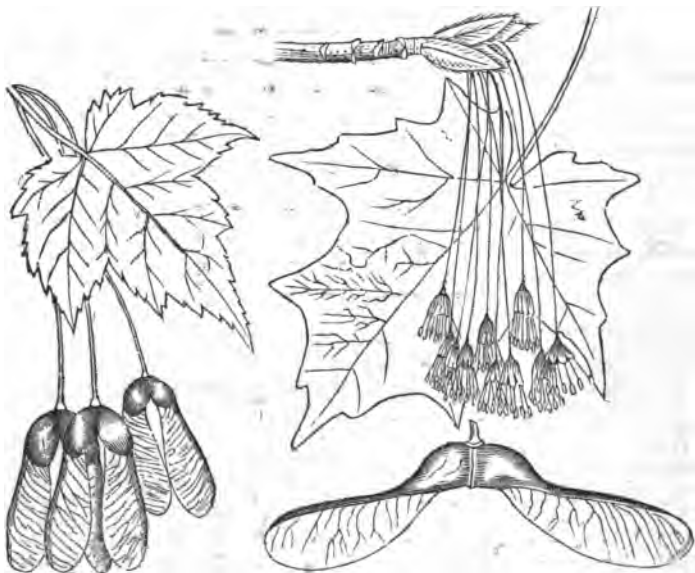


Fig. 221. *Acer rubrum* (Red Maple), a leaf and several samara.

Fig. 222. *Acer saccharinum* (Sugar Maple), leaf, flowers and fruit.

ANALYSIS OF THE GENERA.

Leaves simple, palmate-veined ACER. 1
 Leaves compound, odd-pinnate. *Box-Elder*. NEGUNDO.

1. ACER. MAPLE.

Calyx of 5 united sepals, 5-lobed. Petals 5 or 0. Styles 2.
 Stamens 6—8.—Leaves simple, palmate-lobed. Flowers mostly
 polygamous.

- 1 Pedicels in terminal racemes, flowering after the leaves....4
- 1 Pedicels long, slender, drooping, flowering with the lvs. Large trees....3
- 1 Pedicels in side clusters, short, flowering before the leaves. Trees....2
- 2 Lvs. deeply lobed, square at base, silver-white beneath. Pet. 0. A. *DASYCARPUM*.
- 2 Lvs. lobed, cordate at base, paler beneath. Petals linear-oblong. A. *RUBRUM*.
- 3 Lvs. cordate, 5-lobed with deep, rounded openings betw'n. A. *SACCHARINUM*.
- 3 Lvs. closed up at base, roundish, with 3 broad shallow lobes... A. *NIGRUM*.
- 4 Racemes erect, thyrses-like. Shrub 10—15f high, in clumps... A. *MONTANUM*.
- 4 Rac. drooping. Lvs. 3-lobed. Tree small, striped bark. A. *PENNSYLVANICUM*.
- 4 Rac. long, drooping. A large tree, exotic. Lvs. 5-lobed. A. *PSEUDO-PLATANUS*.

ORDER 47. LEGUMINOSÆ.—LEGUMINOUS PLANTS.

*Plants with alternate, mostly compound stipulate leaves, with
 4—5 sepals, 5 petals more or less papilionaceous, sometimes regular,
 about 10 stamens monadelphous, diadelphous or distinct,
 a single, simple pistil producing a legume in fruit, and with
 no albumen in the seeds.*



Fig. 223. 1, Sweet Pea (*Lathyrus odoratus*). 2, The stamens, the upper one free, and with the style bent upwards. 3, The legume (pod). 4, The seed, showing the embryo and the two large cotyledons. 5, *Hedysarum boreale* (a rare plant), a leaf and jointed pods (lomenta). 6, One of the joints open, showing the seed. 7, Red clover (*Trifolium pratense*). 8, The legume and part of the calyx. 9, Section of a seed. 10, A flower enlarged.

ANALYSIS OF THE GENERA.

- 1 Corolla papilionaceous (§ 292)....2
- 1 Corolla not papilionaceous....22
- 2 Leaves compound, unequally pinnate....6
- 2 Leaves compound, abruptly pinnate....3
- 2 Leaves compound, pinnately 3-foliate....14
- 2 Leaves compound, palmately 3-foliate. Trees.†.....LABURNUM.
- 2 Leaves compound, palmately 3-foliate. Herbs....21

- 2 Leaves compound, palmately 5—15-foliolate. *Lupine*.....LUPINUS. 1
 2 Leaves compound, palmately 2—4-foliolate. *S.*.....ZORNIA.
 2 Leaves simple. Herbs. *Rattle Pod*.....CROTALARIA.
 2 Leaves simple. Shrubs. *Scotch Broom*.....GENISTA.
 2 Leaves simple. Trees. *Judas Tree*.....CERCIS.
- 3 Leaves cirrhose, that is, ending with a tendril....4
 3 Leaves not cirrhose. Stems erect....5
 4 Style bearded on the inside, next the separate sta. *Sweet Pea*. LÁTHYRUS.
 4 Style bearded on the outside. Seeds oval. *Vetch*.....VÍCIA.
 4 Style bearded on the outside. Seeds globose. *Pea*.....PISUM. 3
- 5 Legume very (8—12') long, linear and slender. *S.*.....SESBANIA.
 5 Legume about 2' long. Flowers yellow, small. *S.*.....GLOTTÍDIUM.
 5 Legume about 3' long. Seed-eye terminal. Fls. white. *Coffee Bean*...FABA.
- 6 Herbs with the legumes not jointed....7
 6 Herbs with loment, i. e. with jointed legumes....12
 6 Shrubs twining, unarmed, with colored bracts. *S.*.....WISTARIA.
 6 Shrubs erect, unarmed, with yellow flowers.†.....COLUTEA.
 6 Shrubs erect, unarmed, with blue flowers. *W. S.*.....AMORPHA.
 6 Trees unarmed, with white flowers, in clusters. *S. W.*....CLADÁSTRUS.
 6 Trees or shrubs armed with spines or prickles. *Locust*.....ROBINIA. 3
- 7 Legume 1-seeded. Flowers in dense heads or spikes....8
 7 Legume with 2 or more seeds....9
 8 Stamens 5. Flowers small. Petals clawed. *W. S.*...PETALOSTEMON.
 8 Stamens 10. Flowers small. Petals clawed. *W.*.....DALEA.
- 9 Legumes turgid or terete....10
 9 Legumes flattened on the sides....11
 10 Pods somewhat 2-celled by the proj. back suture. *Milk Vetch*. ASTRÁGALUS.
 10 Pods 1-celled. Keel without spurs, obtuse. *r.*.....PHACA.
 10 Pods 1-celled. Keel with a subulate spur each side.....INDIGFERA.
- 11 Leaflets 5—7. Stems climbing and twining. Fls. purple.....APIOS. 4
 11 Leaflets 5—7. Stems erect. Flowers yellow, small. *S.*...CHAPMÁNIA.
 11 Lfts. 9—17. Banner large, roundish, spreading. *Goats' Rue*. TEPHRÓSIA.
 11 Lfts. 9—17. Banner ovate-lanceolate, straight. *Liquorice*. GLYCIRRHIZA.
 12 Flowers in simple umbels. In gardens.....CORONILLA.
 12 Flowers in racemes....13

- 13 Stamens in 2 equal sets, 5 in each. *S. M.*.....*ÆSCHYNOMENE*.
 13 Stamens in 2 sets, 9 in one set and 1 alone. *N-E. r.*.....*HEDYSARUM*.
 14 Pods straight- or even-edged legumes....15
 14 Pods notched- or crenate-edged, jointed lomentos23
 15 Legumes 1-seeded only, indehiscent (not opening)....16
 15 Legumes mostly 2-seeded, rarely 1-seeded....17
 15 Legumes with several or many seeds....18
 16 Calyx with 2 bractlets at base. *Bush Trefoil*.....*LESPEDEZA*. 5
 16 Calyx naked, inclosing the indehiscent pod. *W. c.*.....*PSORALEA*.
 17 Cal. 4-toothed. The 1—2-seeded pods under ground. Vine. *AMPHICARPEA*.
 17 Cal. 4-toothed, upper tooth bifid at apex. Stem erect. *S.*.....*PITCHERIA*.
 17 Cal. 5-toothed, the 2 upper partly united. Mostly trailing. *S. RHYNCHOSIA*.
 17 Cal. equally 5-toothed. Stem erect. *Sweet Clover*.....*MELILOTUS*.
 18 Calyx 5-toothed....19
 18 Calyx 4-toothed or cleft....20
 18 Calyx nearly entire. Flowers and seeds scarlet. *S.*.....*ERYTHRINA*.
 19 Keel and included stamens spirally twisted or coiled.....*PHASEOLUS*. 6
 19 Keel obtuse, on short claws. Banner spurred behind. *S.*.....*CENTROSEMA*.
 19 Keel acute, on long claws. Banner very large, spurless. *S.*.....*CLITORIA*.
 20 Banner with 2 or 4 callous spots at the base. *S.*.....*DOLICHOS*.
 20 Banner without callosities, broad. Bracts deciduous. *S.*.....*GALACTIA*.
 21 Stamens diadelph. (9 & 1). Legume curved or spiral. *Medick*. *MEDICAGO*.
 21 Sta. diadelph. (9 & 1). Legume small. Fls. in heads. *Clover*. *TRIFOLIUM*. 7
 21 Sta. 10, distinct, equal. Fls. racemed, &c. *False Indigo*.....*BAPTISIA*. 8
 22 Herbs armed with hooked spines. Corolla regular. *S.*.....*SCHRANKIA*.
 22 Herbs unarmed and smooth. Corolla regular. *S-W.*.....*DARLINGTONIA*.
 22 Herbs unarmed. Corolla irregular, yellow.....*CASSIA*. 9
 22 Herbs unarmed. Corolla regular, valvate, yellow.....*ACACIA*.
 22 Shrubs with a regular corolla and sensitive leaves.....*MIMOSA*.
 22 Trees unarmed. Leaves unequally bipinnate. *M. S. W.* *GYMNOCLADUS*.
 22 Trees unarmed. Leaves abruptly bipinnate. *S. ACACIA* *JULIBRASSIN*.
 22 Trees armed with simple spines. Flowers yellow. *S.*.....*VACHELLIA*.
 22 Trees armed with triple spines. Fls. green. *Honey Locust*. *GLEDITSCHIA*.
 23 Loment 2-jointed and 1-seeded. Flowers yellow. *S.*.....*STYLOSANTHES*.
 23 Loment several-jointed and several-seeded. Fls. white, &c. *DESMODIUM*.

1. LUPINUS. LUPINE.

Calyx deeply 2-lipped, upper lip 2-cleft, lower entire or 3-toothed. Wings united towards the top, keel acuminate. Stamens monadelphous, the filaments forming an entire sheath. Anthers alternately oblong and globose. Pod leathery and knotted.—Herbs, with leaves palmately 5—15-foliolate.

L. PERENNIS. Root creeping, perennial. Stem erect, 1—2f high, hairy. Leaflets soft-downy, 7—11, oblanceolate; $1\frac{1}{2}$ —2' long, broadest above the middle. Flowers alternate, in an erect, terminal raceme, blue, varying to white. Calyx without appendages, upper lip emarginate, lower entire. It is often called *Sun-dial*, from the fact of its leaves turning to face the sun from morning till night.—Several other species are cultivated in gardens. *May, June*.

2. PISUM. PEA.

Calyx divisions leaf-like, 2 upper shortest. Banner large, reflexed. Stamens 10, diadelphous (9 & 1). Style flattened, keel-shaped, bearded on the upper side. Legume oblong, tumid. Seeds globose.—Climbing herbs. Leaves pinnate, ending with a branching tendril.

P. SATIVUM. (*Common Garden Pea*.) Leaflets usually 4, ovate, entire. Stipules rather larger than the leaflets (2—3' long), ovate, half-cordate at base. Flowers 2 or more on axillary peduncles, large, white. Pods 2 or 3' long, 5—9-seeded. A very valuable leguminous plant all over smooth and glaucous. There are many varieties. *June*.

3. ROBINIA. LOCUST.

Calyx short, bell-shaped, 5-cleft, the 2 upper divisions more or less united. Banner large, wings obtuse. Stamens diadelphous (9 & 1). Style bearded inside. Legume flattened, long, many-seeded.—Trees and shrubs with stipular spines. Leaves unequally pinnate. Flowers showy, in axillary racemes. *April, May*.



Fig. 224. Common Pea. *s*, The large stipule; *p*, the pod; *f*, the flower; *t*, the tendrils on the end of the leaf.

1 Trees with spines, soft foliage, and racemes of white flowers....2.

1 Shrubs 4—9f high, hispid, with clusters of large, purple fls....*R. HISPIDA*.

2 Racemes loose and slender, fragrant, drooping, smooth....*R. PSEUDACÁCIA*.

2 Racemes rather compact, rose-white. Branchlets and stalks sticky. *R. VISCOSA*.

4. APIOS. GROUND-NUT.

Calyx bell-shaped, somewhat 2-lipped, the 2 side teeth nearly obsolete, the lower tooth longest. Keel incurved and at length coiled against the very broad, reflexed banner. Ovary sheathed at base.—Twining, smooth herbs.—4 Root bearing eatable tubers. Leaves pinnately 5—7-foliate.

A. TUBEROSA. Stem round, twining about other plants, 2—4f in length. Leaflets mostly 7, narrow-ovate, more or less acuminate, on short stalks. Racemes axillary, solitary, dense-flowered, shorter than the leaves. Flowers dark purple. The tubers on the root are oval, thick, and very nutritious. In thickets and shady woods. *July, Aug.*

5. LESPEDYZA. BUSH CLOVER.

Calyx 5-parted, with 2 bractlets at base, the sepals nearly equal. Keel very obtuse, on slender claws. Stamens diadelphous (9 & 1). Legume lens-shaped, small, flattened, unarmed, one-seeded, not opening.—4 Leaves pinnately trifoliate. Flowering in *Aug., Sept.*

1 Flowers in dense spikes, whitish, with a purple spot on the banner....2

1 Fls. racemed, &c., violet or purple. Some of the fls. with no corolla....3

2 Leaflets elliptical, silky. Spikes shorter than the leaves. Erect. *L. CAPITATA*.

2 Leaflets roundish-oval. Spikes longer than the leaves. Erect....*L. HIRTA*.

3 Stem prostrate, trailing, diffuse. Leaflets oval....4

3 Stem erect and mostly branched, 1—3f high....5

4 Plants clothed with down, except the upper side of the lvs....*L. PROCUMBENS*.

4 Plants nearly smooth, very slender and delicate. *M. S.*.....*L. REPENS*.

5 Clusters few-flowered, loose. Plants smoothish. Pods ovate....6

5 Clusters many-flowered, dense. Plants downy. *M. S.*.....*L. STÜVEI*.

6 Leaflets oval, obtuse, 6—12" long, 4—8" wide. Plant bushy....*L. VIOLÆEA*.

6 Leaflets oval-oblong, 3—6" long, 1—2" wide. Plant bushy. *L. SESSILIFLORA*.

6 Lfts. linear, 10—18" long, 1½—3" wide. Smooth, subsimple. *L. RETICULATA*.

6. PHASEOLUS. BEAN, &c.

Calyx 5-toothed or cleft, the 2 upper teeth half united. Keel including the stamens and style, and with them spirally coiled or twisted. Legume straight or curved, many-seeded. Seeds oblong,

kidney-shaped.—Herbs twining or trailing. Leaves pinnately trifoliate, stipellate. *June—Oct.*

- 1 Species growing only by cultivation....3
- 1 Species growing wild in fields and woods....2
- 2 Pods curved and flattenod. Racemes loose, paniced....5
- 2 Pods straight, teretish. Flowers in very short, dense racemes or heads....6
- 3 Pods nearly straight, terete or knotted....4
- 3 Pods curved, flattened, with flattened seeds. Stem twining...*P. LUNATUS.*
- 4 Fls. scarlet and showy. Stem twining. Root tuberous, 7. ...*P. MULTIFLORUS.*
- 4 Fls. white. Stem twining. Seeds variously colored.....*P. VULGARIS.*
- 4 Fls. white. Stem erect, bushy. Seeds mostly white, small.....*P. NANUS.*
- 5 Leaflets round, ovate, short-pointed, entire.....*P. PERENNIS.*
- 5 Leaflets divided into 2 or 3 rounded lobes. *S.*.....*P. SINUATUS.*
- 6 Leaflets 2 or 3-lobed. Ped. 1 or 2 times longer than the lvs. *P. DIVERSIFOLIUS.*
- 6 Leaflets all entire. Peduncles 4 or 5 times longer than the lvs. *P. HELVOLUS.*
- 6 Lfts. all entire, linear-oblong. Ped. twice longer than the lvs. *P. LEIOSPERMUS.*

7. TRIFOLIUM. CLOVER. TREFOIL.

Calyx 5-cleft, with bristly teeth, persistent. Petals more or less united at the base, persistent and withering. Banner longer than the wings, which are also longer than the keel. Stamens 10,adelphous (9 & 1). Legume short, membranous, often included in the calyx, 1—6-seeded, mostly indehiscent.—Herbs with palmately trifoliate leaves. Leaflets straight-veined. Flowers in heads or spikes. *Apr.—Sept.*

- 1 Flowers purple or roseate, sessile in compact heads....3
- 1 Flowers white or roseate, pedicellate, in long-stalked heads....2
- 1 Flowers yellow, persistent, changing to brown when old....7
- 2 Stipules membrane-like. Plants smooth. Leaflets broad-obcordate....5
- 2 Stipules leaf-like, green. Plants downy. Pods 3—5-seeded....6
- 3 Heads roundish or ovate, corollas larger than the calyx teeth....4
- 3 Heads oblong-cylindric, very hairy with long plumose sepals. *T. ARVENSE.*
- 4 Stipules broad-ovate, bristle-pointed. Leaflets whitish spotted. *T. PRATENSE.*
- 4 Stipules narrow-lanceolate. Leaflets spotless. Stem zigzag....*T. MEDIUM.*
- 5 Stems all creeping. Peduncles 5'—8' long. Pods 4-seeded....*T. REPENS.*
- 5 Flowering sts. erect. Hds. 1' thick. Pods 2-seeded. *W. T. STOLONIFERUM.*
- 6 Ascending. Leaflets obovate-oblong. Hds. 40—50-flowered. *W.S.T. REFLÉXUM.*
- 6 Finally diffuse. Lfts. wedge-obcord. Hds. 10—20-flw. *S. T. CAROLINIANUM.*
- 7 Lfts. all nearly sessile (palmately 3-foliate). Hds. 4' thick. *T. AGRARIUM.*
- 7 Lfts. (pinnately 3-foliate) upper one stalked. Hds. 4' thick. *T. PROCUMBENS.*

8. BAPTISIA. WILD INDIGO.

Calyx 4—5-cleft half way. Petals of about equal length, somewhat united. Banner roundish, notched at the end. Stamens 10, distinct, deciduous. Pod inflated, many-seed, raised on a stalk in the persistent calyx.—4 Large herbs with leaves palmately 3-foliate or simple. Flowers in racemes. Leaflets mostly oblong, broadest above. *Apr.—Sept.*

- 1 Leaves simple. (Several species far to the South omitted.)
- 1 Leaves palmately trifoliate....2
- 2 Stipules minute and caducous (soon falling off)....3
- 2 Stipules large and mostly persistent....8
- 3 Flowers white or cream-color....7
- 3 Flowers yellow....4
- 4 Flowers large (an inch or more in length)....6
- 4 Flowers small (half an inch long)....5
- 5 Pedicels bractless, shorter than the flowers.....B. TINCTORIA.
- 5 Pedicels with 2 bracts, longer than the flowers. S.....B. LECONTH.
- 6 Peds. shorter than the calyx. Rac. long, spike-form. S...B. SPHEROCARPA.
- 6 Peds. longer than the calyx. Fls. nodding, few in the rac...B. MEGACARPA.
- 7 Flowers white, in a long raceme. Height 2f. S.....B. ALBA.
- 7 Flowers yellowish-white, axillary. Height 2—3f. S.....B. LANCEOLATA.
- 8 Flowers white or whitish....9
- 8 Flowers indigo-blue, very large. M. S. (Gardens.).....B. AUSTRALIS.
- 9 Downy. Flowers grayish, erect. Leaves nearly sessile. S...B. VILLOSA.
- 9 Hairy. Flowers cream-colored, drooping. W. S.....B. LEUCOPHYEA.
- 9 Smooth. Flowers white. Leaflets wedge-obovate. W....B. LEUCANTHA.

9. CASSIA. WILD SENNA.

Sepals 5, scarcely united at base, nearly equal. Petals 5, unequal, but not papilionaceous. Stamens 10, distinct, 3 upper anthers often sterile, 3 lower ones beaked. Legume many-seeded.—Leaves simply and abruptly pinnate, mostly with a gland on the petiole. Flowers yellow. *July, Aug.*

- 1 Racemes axillary. 3 of the anthers imperfect, 7 of them perfect....2.
- 1 Racemes above the axils. Anthers all perfect. Stem 1—2f high....3.
- 2 Leaflets 4—6, obtuse. Pods 6' long. Stem 1—3f high. S....C. OBTUSIFOLIA.
- 2 Leaflets 6—12, acute. Pods 5' long. Stem 4—6f high. S...C. OCCIDENTALIS.
- 2 Leaflets 12—18, mucronate. Pods 4' long. Stems 5f high. C. MARILANDICA.
- 3 Anthers 10, unlike. Fls. large. Leaflets 16—24.....C. CHAMECRISTA.
- 3 Anthers 5, alike. Fls. small. Leaflets 12—30.....C. NICTITANS.

ORDER 48. ROSACEÆ.—ROSEWORTS.

Trees, shrubs or herbs with stipules mostly, and alternate leaves, with flowers regular, commonly showy, perfect, and polyandrous, with 5 sepals united at base, often supported by as many bractlets outside, 5 petals (rarely 0), which are perigynous as well as the stamens. 1—∞ pistils which are distinct, or sometimes united and adhering to the calyx tube. Fruit various. Seeds with no albumen.



Fig. 225. 1, *Potentilla arguta*, flower and leaf. 2, Vertical section of a flower with the petals removed, showing the perigynous disk, stamens, ovaries, &c. 3, Enlarged ovary and style. 4, Mature ovary. 5, Section showing the seed and seed-stalk. 6, Vertical section of a flower of *Fragaria*, showing the perigynous stamens, the ovaries, &c. 7, Enlarged carpel. 8, Fruit, consisting of the enlarged receptacle with the achenia outside. 9, Perigynous stamens of *Garden Raspberry*. 10, Fruit, the fleshy carpels clustered. 11, Section of the fruit. 12, Flower of the apple tree. 13, Section of a rose, showing the distinct carpels in the calyx tube.

ANALYSIS OF THE GENERA.

- 1 Calyx open and free from the naked ovary or ovaries....2
- 1 Calyx tube adherent to the ovaries or, at least, inclosing them....5
- 2 Ovary or pistil one only. Fruit a drupe (stone-fruit)....3
- 2 Ovaries or pistils few or many (3—50). Fruit not a drupe....9
- 3 Calyx persistent. Style lateral. Shrubs far south....*CHRYSOBALANUM*.
- 3 Calyx deciduous. Style terminal. Trees and shrubs....4
- 4 Stone smooth, globose. Fruit smooth but not glaucous. *Cherry*. *CÉRASUS*. 1
- 4 Stone smooth, flattened. Fruit smooth. *Plum*.....*PRUNUS*.
- 4 Stone smooth, flattened. Fruit downy. *Apricot*.....*ARMENIACA*.
- 4 Stone roughened with pits and furrows. Fruit fleshy. *Peach*...*PÉRSICA*.
- 4 Stone roughened with pits and furrows. Fruit dry. *Almond*. *AMYGDALUS*.
- 5 Calyx tube cohering with the 2—5 ovaries; fruit a pome....6
- 5 Calyx tube inclosing the ovaries, but not cohering with them....7
- 6 Petals roundish. Pome with bony, 1-seeded cells. *Thorn-bush*. *CRATÆGUS*.
- 6 Petals roundish. Pome with thin, 2-seeded cells. *Apple*, &c.....*PYRUS*. 2
- 6 Petals roundish. Pome with 5, many-seeded cells. *Quince*....*CYDONIA*.
- 6 Pet. narrow-obovate. Pome with 5 double cells. *Shad-bush*. *AMELANCHIER*. 3
- 7 Carpels numerous. Petals 5—∞. Stamens many. *Rose*.....*ROSA*. 4
- 7 Carpels 1—4. Petals wanting....8
- 7 Carpels 1—4. Petals 5. Sta. ∞. Fls. small, yellow.....*AGRIMONIA*.
- 8 Sta. 1—4. Lvs. palmate, all radical. Mountains. *N*.....*ALCHEMILLA*.
- 8 Sta. 4. Lvs. pinn., cauline. Gardens. *Burnet Saxifrage*....*SANGUISORBA*.
- 8 Sta. 20—30. Leaves pinnate, cauline. Gardens. *Burnet*....*POTERIUM*.
- 9 Fruit seed-like (achenia)....10
- 9 Fruit a compound berry (§ 385) composed of many little drupes. *Rubus*. 5
- 9 Fruit several little follicles....14
- 10 Achenia on a dry and flattish receptacle....11
- 10 Ach. on a spongy receptacle which is tasteless. Fls. purple. *Cómarum*.
- 10 Achenia on a juicy receptacle which is sweet and eatable....*FRAGARIA*. 6
- 11 Styles persistent on the fruit....12
- 11 Styles deciduous after flowering....13
- 12 Petals and sepals 8 or 9. A low plant, on mountains. *N*.....*DRYAS*.
- 12 Petals and sepals 5. Achenia numerous. *Avens*.....*GEUM*. 7

- 13 Plants with cauline, compound leaves. Stamens 00.... POTENTILLA. 8
 13 Plants with cauline, compound leaves. Sta. 5. *Mts.* SIBBÁLDIA.
 13 Plants with cauline, undivided leaves. Bracilets 0..... DALIBÁRDA. 9
 13 Plants with the leaves all radical. Flowers yellow.... WALDSTEÍNIA. 10
 14 Follicles 2—10-seeded. Flowers white or rose-color.... 15
 14 Follicles 1-seeded. Fls. (double) yellow. Shrub in gardens... KÉRRIA.
 15 Petals obovate, equal. Leaves simple or pinnate..... SPIRÆA. 11
 15 Petals lance-linear, unequal. Leaves 3-foliate..... GILLÉNIA.

1. CER'ASUS. CHERRY

Calyx 5-cleft, regular, deciduous. Petals 5, much spreading. Stamens 15—30. Ovary with 2 ovules. Drupe globular, very smooth, destitute of a glaucous bloom. Stone also globular and smooth.—Trees or shrubs. Leaves folded in the bud. Fls. early, white. *May.*

- 1 Flowers in umbel-like clusters from side buds. Fruit red.... 2
 1 Flowers in racemes. Cherries black or nearly so.... 5
 2 Trees erect, usually of small size.... 3
 2 Shrubs trailing, with lance-obovate leaves. *Sand Cherry*..... C. PÚMILA.
 3 Trees cultivated for their large, red fruit.... 4
 3 Trees wild, with small red cherries. *Wild Red*, N.... C. PENNSYLVÁNICA.
 4 Leaves oblong-ovate. Fruit cordate at base. *Ox-hearts, &c.*.... C. ÁVÍUM.
 4 Lvs. lance-ovate. Cherries globose. Tree smaller. *Large Red*. C. VULGARIS.
 5 Racemes at the end of leafy branches. Leaves deciduous.... 6
 5 Racemes in the axils of the persistent, evergreen lvs. S.... C. CAROLINIÁNA.
 6 Trees with lance-oblong, blunt-toothed leaves. *Wild Black*.... C. SEROTÍNA.
 6 Shrubs with oval-obovate, slender-toothed leaves. *Choke*.... C. VIRGINIÁNA.

2. PYRUS. PEAR. APPLE.

Calyx urn-shaped, limb 5-cleft. Petals 5, roundish. Stamens 00. Styles 2—5. Pome fleshy or berry-like, containing 2—5 cartilaginous (thin and elastic) carpels, each with 2 seeds.—Trees or shrubs. Leaves simple or pinnate. Flowers showy, white or rose-colored, in cyme-like umbels. *May, June.*

- 1 Leaves simple.... 2
 1 Lvs. pinnate. Clusters with very numerous fls. and scarlet berries.... 3
 2 Trees with the flowers in simple (single) clusters.... 4
 2 Wild shrubs, 5—8f high. Clusters compound. *Choke-berry*.... P. ARBUTIFÓLIA.

- 3 Tree 10—20f high, with acuminate leaflets. *Mountain Ash*... P. AMERICANA.
 3 Tree 20—40f high, with acute leaflets. *Rowan-tree*..... P. AUCUPARIA.
 4 Styles united and woolly at base. Fls. large and fragrant. Fr. round.... 5
 4 Styles distinct.... 6
 5 Leaves smoothish, cut-serrate or lobed. *Sweet-scented Crab*... P. CORONARIA.
 5 Leaves downy, blunt-serrate. Calyx woolly. *Apple-tree*..... P. MALUS.
 6 Lvs. lance-oblong, serrate. Fr. round. *Narrow-leaved Crab*. P. ANGUSTIFOLIA.
 6 Leaves ovate, nearly entire. Fruit pear-form. *Pear-tree*..... P. COMMUNIS.

3. AMELAN'CHIER. JUNE-BERRY.

Calyx 5-cleft. Petals 5, oblong-ovate and oblanceolate. Stamens short. Styles 5, somewhat united at base. Pome 5-celled, cells cartilaginous, each nearly divided into two 1-seeded divisions. Small trees or shrubs with simple, serrate leaves, and white early flowers in racemes.

A. CANADENSIS. *Shad-berry. June-berry.* A small tree or shrub found in woods, with a dark grayish bark. Flowers large white, in racemes at the ends of the branches, appearing in April and May, while the forests are yet naked. Fruit round, purplish, well-flavored, ripe in June. The plant is very variable in size, and in the leaves, &c.

4. ROSA. ROSE.

Calyx tube urn-shaped, fleshy, contracted at the throat, limb 5-cleft, the sepals generally with a little leaf at tip. Petals 5 (greatly multiplied by culture); achenia 00, bony, hispid, included in and attached to the inside of the fleshy calyx tube.—Shrubby and prickly plants. Leaves unequally pinnate. Stipules attached to the petiole. *Apr.—July, mostly.*

- 1 Roses growing wild in the United States.... 2
 1 Cultivated roses, never growing wild here. (All omitted.)
 2 Stems long, flexible, climbing or trailing. Leaflets generally but three.... 9
 2 Stems erect, not climbing or trailing.... 3
 3 Armed with straight spines, or nearly straight.... 6
 3 Armed with hooked or curved, strong spines.... 4
 4 Leaflets smoothish, simply serrate, not fragrant.... 5
 4 Leaflets rusty with glands beneath, doubly-serrate, very fragrant.... 8
 5 Leaves dull green. Fls. in corymbs. *N. M. Swamp Rose*... R. CAROLINA.
 5 Leaves shining green. Fls. solitary. *S-W. Macartney*..... R. BRACKETATA.
 6 Peduncles and calyx bristly. Leaves shining.... 7
 6 Peduncles and calyx smooth. Prickles few. *N. Bland*..... R. BLANDA.

- 7 Leaflets elliptical. Stems green, with few prickles.....R. LUCIDA.
 7 Lfts. narrow-lance. Stems reddish, prickles very numerous. N. R. NITIDA.
 8 Cal. persist. Some of the prickles awl-shaped. *Sweet-briar*...R. RUBIGINOSA.
 8 Calyx decid. All the prickles hooked alike. *Small-flowered*...R. MICRANTHA.
 9 Fls. corymbose, rose-colored, changeable. W. S. *Prairie*....R. SETIGERA.
 9 Fls. solitary, white. Stipules bristle-form. S. *Cherokee*....R. LEVIGATA.

5. RUBUS. BRAMBLE. BLACKBERRIES AND RASPBERRIES.

Calyx 5-parted, without bractlets. Petals 5, deciduous. Stamens 00. Ovaries many, becoming many pulpy, drupe-like achenia (grains) united into a compound fruit.—Half-shrubby plants with 4 roots and 2 stems, armed with prickles. Flowers mostly white. In the *Blackberries* the pulpy receptacle constitutes a part of the fruit, but in the *Raspberries* it does not.

- 1 Leaves simple, 3—5-lobed. Flowers large....4
 1 Leaves compound, of 3—7 leaflets....2
 2 Stems stout, upright, often recurved at top....3
 2 Stems weak, trailing or prostrate....7
 3 The side leaflets stalked. Prickles strong, recurved....8
 3 The side leaflets sessile. Prickles weak, nearly straight....5
Raspberries.
 4 Petals round, purple. Stalks hairy-clammy. *Rose Flowering*...R. ODORATUS.
 4 Pets. broad-oval, white. Fls. several. N-W. *White Flowering*. R. NUTKANUS.
 4 Pets. obovate, white. Fl. only one. *Mounts*. *Cloud-berry*...R. CHAMEMORUS.
 5 Petals as long or longer than the calyx....6
 5 Petals shorter than the calyx. *Garden Raspberry*.....R. IDEUS.
 6 Corolla cup-shaped, single. *Wild Red Raspberry*.....R. STRIGOSUS.
 6 Corolla spreading, double. *Bridal Rose*. *Cultivated*.....R. ROSEFOLIUS.
 7 Stems prickly, shrubby, biennial. Fruit of many grains....10
 7 Stems entirely unarmed, green, ① Fruit of few grains....R. TRIFLORUS.
 8 Pl. glaucous. Pets. shorter than sep. Fr. dark. *Thimble-berry*. R. OCCIDENTALIS.
 8 Plants not glaucous. Petals much longer than the sepals....9

Blackberries.

- 9 Flowers in racemes. Leaflets ovate. *High Blackberry*.....R. VILLOSUM.
 9 Fls. 1—3 together. Lfts. wedge-obovate. M.S. *Sand Blackb.* R. CUNEIFOLIUS.
 10 Prickles many. Flower-stalks without leaves or bracts....11
 10 Prickles few. Flower-stalks with leafy bracts. *Dewberry*...R. CANADENSIS.
 11 Flowers small, with spreading sepals. *Hispid*, *Running Bl.*...R. HISPIDUS.
 11 Flowers large, with reflexed sepals. S. *Low Bush Bl.*....R. TRIVIALIS.

6. FRAGARIA. STRAWBERRY.

Calyx deeply 5-cleft, with an equal number of alternate bractlets

outside. Petals 5, obovate. Stamens 00. Achenia many, fixed to the surface of the large, conical, pulpy, scarlet or white receptacle.—Low η stemless plants with trifoliate leaves, cymes of white flowers on scapes, and sending out runners from the base. Our two native species can be distinguished by the fruit only, the leaves and flowers being alike. Thus:

F. VIRGINIANA. Recep. holding the achenia in little pits, roundish egg-shaped.
F. VESCA. Receptacle holding the achenia on its even surface, cone-shaped.

7. GE'UM. AVENS.

Calyx 5-cleft, usually with 5 alternate bractlets outside. Petals 5. Stamens many, collected on a dry receptacle and bearing the long, persistent style.— η Leaves pinnate or lyrate.

- 1 Style bent and jointed near the middle....2
- 1 Style straight and not jointed, wholly persistent. Rare plants....6
- 2 Head of fruits quite sessile, with the styles finally hooked....3
- 2 Head of fruits stalked in the calyx more or less....5
- 3 Petals yellow, longer than the calyx....4
- 3 Petals white, as long as the calyx. Receptacle hairy....G. VIRGINIANUM.
- 4 Lvs. ending with a very large roundish leaflet. *Mounts*...G. MACROPHYLLUM.
- 4 The end leaflet but little larger than the rest. Height 3—5f....G. STRICTUM.
- 5 Petals yellow, small. Stalk as long as the head. *W*.....C. VERNUM.
- 5 Whole flower dark purple, large, nodding. *Water Avens*.....G. RIVALE.
- 6 Bractlets longer than the calyx or *purplish* petals. Fls. 3. *W*...G. TRIFLORUM.
- 6 Bractlets minute. Petals yellow. Stem almost leafless. *Ms*....G. PECKII.

8. POTENTILLA. CINQUEFOIL.

Calyx deeply 4—5-cleft, with an equal number of alternate bractlets outside. Petals 4—5, obovate. Stamens 00. Achenia 00, collected in a head on a small, dry receptacle.—Herbs or shrubs with compound leaves and (mostly) yellow flowers.

- 1 Leaves palmately compound....2
- 1 Leaves pinnately compound....6
- 2 Leaflets 3 only in each leaf....3
- 2 Leaflets 5. Stems prostrate or inclining....5
- 3 Flowers yellow. Stems herbaceous....4
- 3 Fls. white. Lfts. wedge-obovate, 3-toothed at end. *N*....P. TRIDENTATA.
- 4 Erect, many-flowered. Petals shorter than the sepals. *N. M.* P. NORVÆGICA.
- 4 Low, tufted. Stems 1-flowered. Pet. longer than sepals. *Ms*....P. MINIMA.

- 5 Leaflets green both sides, serrate, oblong. Ped. 1-flowered. *P. CANADENSIS*.
 5 Lfts. silvery-white beneath, pinnatifid. Flowers in cymes... *P. ARGENTÆA*.
 6 Erect, handsome shrubs with yellow flowers. Height 1—2½. *P. FRUTICOSA*.
 6 Stemless herbs. Leaves and peduncles radical. *Goose-grass*... *P. ANSERINA*.
 6 Herbs with leafy stems. (3 rare species—omitted.)

9. DALIBAR'DA. FALSE VIOLET.

Calyx deeply 5 or 6-parted, 3 of the segments larger. Petals 5. Stamens many. Styles 5—8, long, deciduous. Fruit 5—8 dryish drupe-like achenia.—4 Low herbs with creeping stems, simple leaves and 1—2 white flowers on each stalk. *N.*

D. REPENS. Found in damp woods. Creeping stems a few inches to a foot in length. Leaves roundish-cordate, crenate. Stipules very narrow-linear. Petioles 1—3' long. Scapes 1-flowered, about as long as the petioles. *June*.

10. WALDSTEINIA. DRY STRAWBERRY.

Calyx 5-cleft, with 5 alternate, sometimes minute and deciduous bractlets. Petals 5 or more, sessile. Stamens many. Styles 2—6. Achenia few, dry, on a dry receptacle.—4 Acaulescent herbs with lobed or divided radical leaves and yellow flowers on scapes.

W. FRAGARIOIDES. A pretty plant, in hilly woods, bearing some resemblance to the strawberry. Root-stock thick, scaly, blackish. Leaves trifoliate, on petioles 3—6' long; leaflets broad-wedge-shaped, cut-toothed, of a shining green above. Scapes about as high as the leaves, bearing 2—6 flowers, which are 1' across. *June*.

W. LOBATA. Along rivers, &c. Leaves simple, roundish-cordate, generally 3—5-lobed, &c. *Apr.—June. S.*

11. SPIRÆA. MEADOW-SWEET. HARD-HACK.

Calyx 5-cleft, persistent. Petals 5, roundish. Stamens 10—50, exserted. Carpels distinct, 3—12, forming little 1-celled, several-seeded pods. Styles terminal.—4 Beautiful, unarmed herbs or shrubs with alternate leaves and branches, and small white or rose-colored flowers. *May—Aug.*

1 Shrubs 4—9 feet high....2

1 Herbs with the leaves once or thrice pinnate....7

2 Stipules present....4

2 Stipules none. Leaves simple and undivided....3

- 3 Flowers in panicles. Leaves lance-ovate....5
 3 Flowers in corymbs or little umbels. Leaves oval or ovate....6
 4 Lvs. simple, 3-lobed. Corymbs umbellate. *N. Nine-bark*....S. OPULIFOLIA.
 4 Leaves odd-pinnate. Flowers in panicles. Cultivated.....S. SORBIFOLIA.
 5 Lvs. with a rusty white dense wool beneath. *Hard-hack*....S. TOMENTOSA.
 5 Lvs. nearly smooth. Shrub 3 or 4f high. *Willow-leaved*...S. SALICIFOLIA.
 6 Corymb very large terminal, flat-topped. Height 1—2f. S....S. CORYMBOSA.
 6 Little umbels many, lateral. Cultivated. *St. Peter's Wreath*. S. HYPERICEFOLIA.
 7 Leaves once-pinnate. Inflorescence terminal, on a long stalk....8
 7 Leaves thrice-pinnate. Stip. 0. Fls. in slender spikes. *M.*...S. ARUNCUS.
 8 Flowers purple. Side leaflets 3-lobed. *W. Queen of the Prairie*...S. LOBATA.
 8 Fls. white. Lfts. pinnatifid-serrate. Gardens. *Dropwort*...S. FILIPENDULA.
 8 Flowers white. Lfts. doubly-serrate. Gardens. *Meadow-sweet*...S. ULMARIA.

ORDER 55. ONAGRA'CEÆ.—EVENING PRIMROSES.

Herbs with alternate or opposite leaves, and with the parts of the flowers generally in 4s, sometimes in 3s, 2s or 1s; with the sepals united below into a tube, valvate in the bud; the petals and stamens inserted into the throat of the calyx; ovary coherent with the tube of the calyx, becoming in the fruit a 2—4-celled capsule or berry with many seeds.

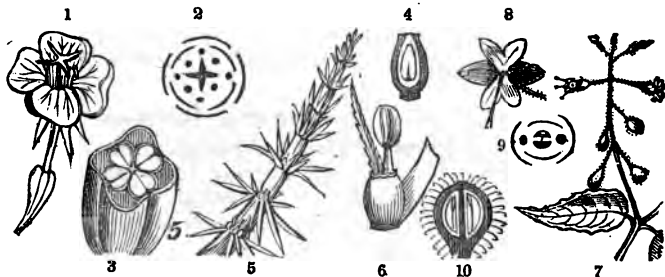


Fig. 226. 1, flower of *Enothera fruticosa*; 2, plan of the flower; 3, section of the 4-celled capsule of *C. biennis*; 4, vertical section of the 1-seeded fruit of *Hippuris vulgaris*; 5, its flower, with 1 stamen, 1 ovary, 1 style; 6, vertical section of its 1-seeded fruit; 7, *Circæa Lutetiana*; 8, the flower enlarged; 9, plan of the flower; 10, vertical section of the 2-celled and 2-seeded fruit.

ANALYSIS OF THE GENERA.

- 1 Flowers 4 or 5-parted (that is, with 4 sepals, 4 petals, &c.) 2
- 1 Fls. 3-parted, with no petals. Water plants, lvs. pectinate.. *PROSERPINACA*.
- 1 Fls. 2-parted, complete and regular. Leaves undivided..... *CIRCÆA*. 1
- 1 Fls. 1-parted, apetalous. Water pls. Lvs. whorled (*Fig. 226, 5*). *HIPPÜRIS*.
- 2 Flowers perfect and complete.... 3
- 2 Fls. monœcious. Water plants with many-cleft leaves... *MYRIOPHYLLUM*.
- 3 Stamens twice as many as the sepals.... 4
- 3 Stamens the same number as the sepals..... *LUDWIGIA*.
- 4 Herbs native of fields, marshes, &c.... 5
- 4 Delicate shrubs, cultivated in houses, &c. Flowers crimson... *FÜCHSIA*.
- 5 Calyx tube much prolonged above the ovary.... 6
- 5 Calyx tube not prolonged above the ovary.... 7
- 6 Pod many-seeded, opening by 4 valves. Fls. mostly yellow. *CENOTHERA*. 2
- 6 Pod 1—4-seeded, nut-like, not opening. Fls. white and red..... *GAURA*.
- 7 Seeds crowned with a tuft of long, silky hairs. Fls. purplish... *EPILÖBIUM*. 3
- 7 Seeds not crowned, &c. Flowers large, yellow. Southern.... *JUSSIEA*. 4

1. *CIRCÆA*. ENCHANTER'S NIGHTSHADE.

Calyx tube a little prolonged above the ovary, lobes 2. Petals 2, obcordate. Stamens 2, opposite the sepals. Fruit reflexed, inversely egg-shaped, with hooked hairs, 2-celled, 2-seeded.—4 Small, tender herbs, with opposite leaves and terminal racemes of small, reddish-white flowers.

C. LUTETIANA. (*See the figure.*) Stem 1—2f high, sparingly branched, pubescent. Leaves dark green, ovate, subcordate, acuminate, coarsely toothed. Pedicels without bracts, bent down after flowering. Fruit clothed with bristly hooks. *June, July*.

C. ALPINA. Stem 5—10' high, very smooth. Leaves pale green, broad cordate, thin, slightly dentate. Common in rocky woods at the North. *July*.

2. *CENOTHERA*. EVENING PRIMROSE.

Calyx tube prolonged beyond the ovary, deciduous; segments 4, reflexed. Petals 4, equal, obcordate or obovate, inserted into the top of the calyx tube. Stamens 8. Capsule 4-celled, 4-valved.

Stigma 4-lobed. Seeds not tufted.—Herbs with alternate leaves, and yellow flowers (in all the following species). *May—Aug.*

- 1 Flowers opening by night. Pods rounded at the corners, sessile....3
- 1 Flowers opening by day. Pods club-shaped, sharply 4-cornered....2
- 2 Stems erect, 1—3 feet high. Flowers large (1—2' across)....4
- 2 Stems half-erect, 6—16' long. Flowers small (5"—8" across)....6
- 3 Lvs. slightly toothed. Pods oblong. Fls. 1' or more wide...*Æ. BIENNIS.*
- 3 Lvs. sinuate-toothed or pinnatifid. Flowers $\frac{1}{2}$ ' wide. S.....*Æ. SINUATA.*
- 4 Pods scarcely winged on the 4 sharp angles. Leaves narrow....5
- 4 Pods with the 4 angles distinctly winged. Lvs. lanceolate....*Æ. FRUTICOSA.*
- 5 Leaves linear-lanceolate. Fls. finally racemed. *S. M.*.....*Æ. RIPARIA.*
- 5 Leaves linear. Flowers on the ends of the branches. *S. M.*.....*Æ. LINEARIS.*
- 6 Flowers straw-yellow. Pods almost sessile. Common, *N. M.*.....*Æ. PUMILA.*
- 6 Fls. orange-yellow. Pods distinctly stalked. Rare, *N. W.*.....*Æ. CHRYSANTHA.*

3. EPILOBIUM. WILLOW-HERB.

Calyx tube not prolonged above the ovary. Limb deeply 4-parted, deciduous. Petals 4. Stamens 8. Stigma often with 4 spreading lobes. Ovary and capsule linear, 4-cornered, 4-celled, 4-valved. Seeds crowned with a tuft of long hairs.—4 Fls. purplish or white.

E. ANGUSTIFOLIUM. *Narrow-leaved Willow-herb. Rose-bay.* A tall, showy herb (4—6f high), common at the North. Leaves narrow-lanceolate, nearly entire, with a vein running along the margin. Flowers large, all parts pale purple or white, in a long, terminal spike. Style and stamens declined. Stigma with 4 long lobes. *July, Aug.*—Our four other species, with small flowers, and a club-shaped, undivided pistil, we omit.

4. JUSSIEA.

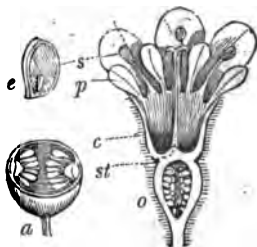
Calyx tube not prolonged above the ovary, lobes 4—6, persistent. Petals 4—6, stamens twice as many. Stigma capitate, 4—6-grooved. Pod lengthened, 4—6-celled, with very numerous naked seeds.—Showy herbs, with yellow (rarely white) flowers, and alternate leaves, growing in the wet grounds of the South and West.

- 1 Flowers 5-parted, large. Stems creeping and ascending....2
- 1 Fls. mostly 6-parted, small. Erect, hairy. Pod slender...*J. LEPTOCARPA.*
- 1 Fls. 4-parted. Stem erect, winged by the decurrent leaves...*J. DECURRENS.*
- 2 Plant smooth. Lvs. obtuse, petiolate. Fls. on long pedicels....*J. REPENS.*
- 2 Plant hairy. Lvs. acute, subsessile. Fls. on short pedicels...*J. GRANDIFLORA.*

ORDER 60. GROSSULACEÆ.—CURRANTS.

Small *shrubs*, often prickly, with alternate, lobed, plaited leaves; *flowers* in axillary racemes, regular, 4 or 5-parted, small; *petals* inserted into the throat of the calyx, small, distinct, and the *fruit* a 1-celled, many-seeded, 2-carpeled berry.

Fig. 227. A flower of the Red Currant cut open; *o*, the ovary and ovules; *st*, the style; *c*, the calyx tube; *p*, the petals; *s*, the stamens; *a*, a berry cut open, showing the two placentas and seeds; *e*, a seed cut open, showing the little embryo.



RUBES. CURRANTS AND GOOSEBERRIES.

The character of the genus is about the same as of the Order.

- 1 Currants. Stems neither prickly nor thorny. Flowers in racemes....2
- 1 Gooseberries. Sts. pr'kly or thorny (rarely smooth). Fls. scarcely racemed.6
- 2 Leaves plaited in the bud. Flowers greenish....3
- 2 Lvs. rolled in the bud. Fls. bright yellow, tubular. Cultivated...R. AUREUM.
- 3 Lvs. 5—7-lobed. Racemes erect. Fruit red, nauseous...R. PROSTRATUM.
- 3 Leaves 3—5-lobed, heart-shaped. Racemes drooping....4
- 4 Leaves with little yellowish dots beneath. Fruit black....5
- 4 Leaves downy beneath. Fruit red. Gardens, also wild.....R. RUBRUM.
- 5 Petioles longer than the leaves. Bracts longer than pedicels. R. FLORIDUM.
- 5 Petioles shorter than lvs. Bracts often shorter, &c. Gardens...R. NIGRUM.
- 6 Peduncles 1—3-flowered. Leaves roundish, 3—5-lobed....7
- 6 Peds. 5—9-flw'd (racemed). Young stems cov'd with prickles. R. LACUSTRE.
- 7 Style 2-cleft or 2-parted....8
- 7 Style undivided, included. Fruit prickly, sweet.....R. CYNOSBATI.
- 8 Sta. and sty. exserted (longer than calyx). Fr. smooth...R. ROTUNDFOLIUM.
- 8 Stamens and style not exserted (included)....9
- 9 Wild plants. Peduncles very short, bractless. Fr. smooth. N. R. HIRTÉLLUM.
- 9 Wild plants. Peduncles long, thread-like. Fr. smooth. S-W. R. GRÁCILE.
- 9 Garden plants. Peds. with 1-fl. and 2 bracts. Fr. large...R. UVA-CRISPA.

ORDER 64. CRASSULACEÆ.—HOUSELEEKs.

Thick, juicy *plants*, with simple, mostly entire leaves, with *flowers* perfectly symmetrical and regular, the *petals*, *sepals* and *pistils* being of the same number (3–20), and the *stamens* either the same or twice as many, the *follicles* (as many as the ovaries) distinct or somewhat united.



Fig. 229.

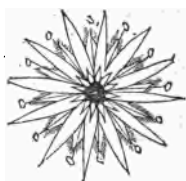


Fig. 230.

Fig. 228, A flowering branch of *Sedum acre*. Fig. 229, A flower of *S. acre*, natural size. Fig. 230, A flower, (12-parted, symmetrical, regular) of *Semprevivum* (Houseleek).

Fig. 228.

ANALYSIS OF THE GENERA.

- 1 Pistils (follicles) entirely distinct and separate....2
- 1 Pistils 4 or 5, united into a 4 or 5-celled capsule....4
- 2 Stamens twice as many as the pistils, petals or sepals....3
- 2 Sta. as many (3 or 4) as the pistils, &c. Herb 1—3' high. *r.*....TILLEA.
- 3 Flowers 5 (rarely 4)-parted. Stamens 10 or 8. *Stone-crop*.....SEDUM. 1
- 3 Fls. 12 (or 6—20)-parted. Stamens 12—40. *Houseleek*....SEMPERVIVUM.
- 4 ② Herb 2—4' high, fleshy, with 4-parted flowers. *S.*.....DIAMORPHA.
- 4 ④ Herb 10—16' high, not fleshy, with 5-parted flowers. *c.*....PENTHORUM.

1. SEDUM. STONE-CROP. ORPINE.

Sepals and petals 5, sometimes 4, distinct. Stamens 10 or 8. Pods 5, sometimes 4, distinct, many-seeded, with an entire scale at

the base of each.—Mostly 4 herbs, with 5-parted flowers in cymes, or in one-sided clusters.

- 1 Flowers white, or purplish, or rose-colored....2
- 1 Flowers yellow. Plant in low tufts. Gardens. *Irish Moss*.....S. ÁCRE.
- 2 Leaves scattered, 1—3' long....3
- 2 Leaves in whorls of 3s. Fls. white, in a 3-spiked cyme.....S. TERNATUM.
- 3 Lvs. lanceolate or obovate, nearly entire. *M. S.*.....S. TELEPHIOIDES.
- 3 Lvs. oval, serrate, obtuse. About houses. Fls. purplish...S. TELEPHIUM.
- 3 Lvs. linear, numerous. Fls. in an umb. of spikes, purp. *S. S.* PULCHÉLLUM.

ORDER 65. SAXIFRAGACEÆ.—SAXIFRAGES.

Herbs or *shrubs* with the pistils fewer than the sepals of the flower; the *petals* as many as the calyx sepals (4 or 5), and together with the 5—10 *stamens* inserted on the calyx, the styles 2, distinct, with their 2 *ovaries* more or less united below, and either free or adhering to cal. *Pods* capsular, many-seeded. *Embryo* slender, in albumen.

ANALYSIS OF THE GENERA.

- 1 Herbs. Petals imbricate in the bud....2
- 1 Shrubs. Petals valvate or convolute (twisted) in the bud....6
- 2 Petals 4—6, generally 5, entire....3
- 2 Petals 5, all pinnatifid. Stamens 10. *Mitre-wort*.....MITÉLLA. 1
- 2 Pets. 0. Little prostrate hrbs. in wet places. *Water-carpel*. CHRYSOSPLÉNium.
- 3 Flowers with 10 stamens each....4
- 3 Flowers with 5 stamens each....5
- 4 Pods 2-celled. Lvs. simple, mostly radical. *Saxifrage*.....SAXÍFRAGA.
- 4 Pods 2-celled. Leaves biternately compound, cauline. *S.*.....ASTÍLBE.
- 4 Pods 1-celled. Leaves palmately lobed. *False Mitre-wort*....TIARÉLLA. 2
- 5 Styles 2, pod 2-celled. Scape reclined, 8—12' long. *W.*.....SULLIVÁNTIA.
- 5 Styles 2, pod 1-celled. Scape erect, a foot or more. *M. W.*.....HEUCHÉRA.
- 5 Styles 3, pod 1-celled. Herb in tufts 4' high. *S.*.....LEPUROPÉTALON.
- 6 Leaves opposite, simple....7
- 6 Leaves alternate. Shrub 4—8f erect. Racemes white. *M. S.*.....ITÉA.
- 7 Shrub climbing trees, &c. Flowers white, fragrant. *S.*.....DECUMÁRIA.
- 7 Shrubs erect. Cymes radiate (§ 255, a). Stamens 8—10. HYDRÁNGEA.
- 7 Shrubs erect. Cymes not radiate—all the fls. perfect...PHILADÉLPHUS. 3

1. MITELLA. MITRE-WORT.

Calyx 5-cleft, bell-shaped. Petals 5, pinnatifid with linear divisions, inserted on the throat of the calyx. Stamens 5 or 10, included. Styles 2, very short. Capsule short, 2-beaked, 1-celled; 2-valved.—4 Small, slender herbs, with roundish, lobed and cordate leaves mostly from the root. Flowers small, in a slender raceme. *N.*

1. *M. DIPHYLLO*. Scape 12–20' high, with 2 opposite leaves nearly sessile, and many white flowers above with curiously cleft petals. *May, June.* (See Fig.)

2. *M. NUDA*. Scape leafless, thread-like, 5–7' high, few-flowered. *May, June.*

Both species send out runners from the base.

Fig. 231. *a*, *Mitella diphylla*; *b*, a flower, magnified; *c*, the fruit pods open, showing the black seeds; *d*, cross section of the ovary; *e*, seed cut open, showing the long embryo.



2. TIARELLA. FALSE MITRE-WORT. GEM-FRUIT.

Calyx 5-parted, lobes obtuse. Petals 5, entire, the claws inserted on the calyx. Stamens 10, exserted. Styles 2. Capsule 1-celled, 2-valved, one valve much larger.—4 Flowers white. *N. M.*

T. CORDIFOLIA. Scape about 10' high, sometimes bearing a leaf, the flowers white in all their parts, forming a cylindrical raceme. In rocky woods, with the *Mitre-wort*, very common at the North. *May, June.*

3. PHILADELPHUS. FALSE SYRINGA.

Calyx 4–5 parted, tube adherent to the ovary, persistent. Corolla 4–5-petaled. Styles 4, more or less united. Stamens 20–40, shorter than the petals. Capsule 4-celled, 4-valved, many-seeded.—Handsome flowering shrubs, with opposite leaves. Petals convolute in the bud.

1. *P. GRANDIFLORUS. Large-flowered Syringa.* A very showy shrub, 6f high. Leaves ovate, acuminate, 3-veined. Stigmas 4, styles united into 1. Flowers large, in umbels of 2—7, white nearly inodorous. Cultivated, but wild at the South. *June.*

2. *P. CORONARIUS. Mock-orange.* Stems 5—8f high. Leaves oval and ovate, short-pointed, feather-veined. Styles and stigmas 4, distinct. Flowers numerous, white, handsome, very fragrant. Cultivated. *June.*

ORDER 67. UMBELLIFERÆ.—UMBELWORTS.

Herbs with hollow, furrowed stems, simple or compound leaves, no *stipules*, but with a broad sheathing base to the petioles; the small *flowers* in umbels, and the *calyx* wholly adherent to the ovary, the *petals* and *stamens* 5, standing on the top of the ovary; the *styles* 2, and the *fruit* dry, its 2 carpels seed-like and separating, marked outside by ribs and furrows running lengthwise.

ANALYSIS OF THE GENERA.

- 1 Plants growing wild, some of them cultivated for the eatable root....2
- 1 Plants never wild, but cultivated for their fruit, &c....18
- 2 Flowers white, rarely rose-colored or cream-colored....3
- 2 Flowers yellow, or (in one instance) dark purple....15
- 3 Umbels simple, leaves simple. Little creeping wet plants....4
- 3 Umbels regularly compound, the flowers not sessile....6
- 3 Umbels irregular, flowers in crowded heads, sessile....5
- 4 Fruit flattened. Lvs. roundish. Fls. sometimes whorled. *c.* HYDROCYTLE.
- 4 Fr. globular. Lvs. linear. Fls. pedicelled. Hight 1—2'. *r.*....CRANTZIA.
- 5 Fruit clothed with hooked prickles. Heads small, 2—4. *c.*....SANICULA. 1
- 5 Fruit clothed with scales. Heads often near 1' thick. *W. S. c.* ERINGIUM.
- 6 Umbels not radiate (§ 255, *a*, outer flowers not larger than the rest)....7
- 6 Umbels radiate, very large. Huge herbs, 4—8f high. *c.*....HERACLEUM.
- 7 Leaves simple linear petioles without blades. *S.*.....TIEDMANNIA.
- 7 Leaves only once divided, pinnately or ternately....8
- 7 Leaves twice or thrice compounded....10
- 8 Fruit flattened or contracted, more or less, on the sides....9
- 8 Fruit much flattened on the back. Stems 2—5f high. *M. S.*....ARCHEMORA.

- 9 Lfts. 3, ovate, doubly serrate. St. 1—2f high. *Hone-wort*.. **CRYPTOTÆNIA. 2**
 9 Lfts. 3, long, linear, grass-like. Not common. *S*.....**NEUROPHÝLLUM.**
 9 Leaflets 5—11, lanceolate or lance-linear. Stem 2—6f high.....**Sium.**
 9 Leaflets 5—9, oblong. Stem procumbent. *S*.....**HELOSCIADÍUM.**
 10 Bracts of the involucre (not involucl) entire....11
 10 Bracts of the involucre cleft and divided12
 10 Bracts of the involucre none or almost none....13
 11 Fruits bristly, club-shaped, few. Stem 1—2f high. *Cicely*.. **OSMORHIZA. 3**
 11 Fruits smooth, flattened on the sides, ribs wavy. Poison.....**CONÍUM. 4**
 11 Fr. smooth, flattened on the back, ribs winged, straight. *r*. **CONIOSELÍNUM.**
 11 Fruit smooth, terete, not flattened, ribs straight. *Lovage*...**LIGÚSTICUM.**
 12 Fruits bristly, short, numerous. Often cultivated. *Carrot*.....**DÁUCUS.**
 12 Fruits smooth. Stems and leaflets thread-like. *Rare*.....**DISCOPLÈRA.**
 12 Fruits smooth. Stem 3—6' erect, bulbous at base. *W*.....**ERIGENIA.**
 13 Fruit flattened on the back. Stems thick and tall. *c*....**ARCHANGÉLICA.**
 13 Fruit flattened on the sides....14
 13 Fruit terete, not flattened. Fœtid and poison. *N. Rare*.....**ÆTHUSA.**
 14 Cal. 5-toothed. Umb. often sessile. Sts. diffuse, slend. *W*. **CHEROPHÝLLUM.**
 14 Cal. 5-toothed. Umbels stalked. Sts. erect, very slender.. *S*. **LEPTOCAULIS.**
 14 Cal. teeth none, fruit strongly ribbed. Poison. *Common*.....**CICUTA. 5**
 14 Calyx teeth none, fruit scarcely ribbed. *W. Rare*.....**EÜLOPHUS.**
 15 Fruit decidedly flattened on the back....17
 15 Fruit flattened on the sides or not at all....16
 16 Involucl. leafy. Lvs. perfoliate, simple, entire. *Modestly*....**BUPLEÛRUM.**
 16 Involucl. minute. Seed with 5 winged ribs.....**THÁSPIUM. 6**
 16 Involucl. minute. Seed with 5 ribs not winged.....**ZÍZIA. 7**
 17 Involucl. minute. Fruit corky. Leaves bipinnatifid....**POLYTÆNIA.**
 17 Involucl. none. Fruit thin. Lvs. pinnate. *Parsnip*.....**PASTINÀCA.**
 18 Flowers white. Involucre 0 or of 1 entire bract....19
 18 Flowers white. Involucre of a few cleft bracts. *Parsley*...**PETROSELÍNUM.**
 18 Fls. yellow. Lf. segments very narrow and many. *Fennel*...**FÆNICULUM.**
 19 Umbellets radiate. Fr. round. Lvs. finely cut. *Coriander*..**CORIÁNDRUM.**
 19 Umbellets not radiate (the flowers all similar)....20
 20 Fr. flattened on the sides, roundish. Lf. segs. wedge-form. *Celery*..**APIUM.**
 20 Fr. flattened on the sides, oval. Lf. segments linear. *Caraway*...**CÁRUM.**
 20 Fr. egg-shaped, not flattened. Lf. segments linear. *Anise*...**PIMPINÉLIA.**

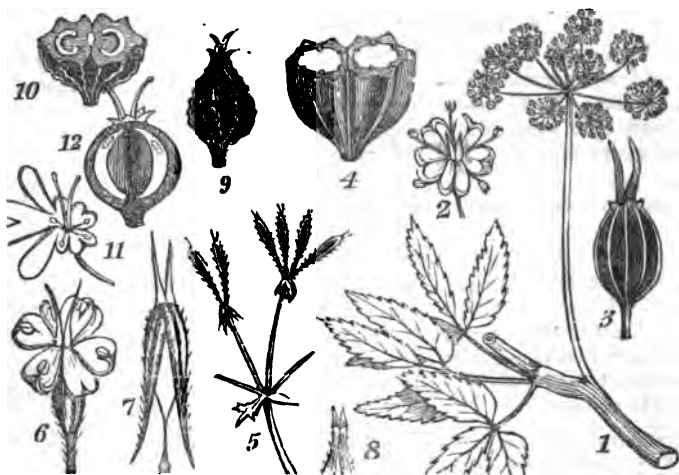


Fig. 232. 1, *Zizia aurea*, with its compound, naked umbel, &c. 2, A flower enlarged. 3, The fruit with its filiform ribs and two persistent styles. 4, Cross section, showing the two carpels with the vittæ and flat inner face. 5, Umbel of *Osmorhiza longistylis* in fruit. 6, A flower enlarged. 7, The fruit with the two carpels separating from the base and supported by a two-cleft stalk. 8, Surmount of the fruit of *O. brevistylis*. 9, Fruit of Poison Hemlock, with the undulate-crenulate ribs. 10, Cross section, showing the grooved inner face and involute albumen. 11, Radiate flower of *Coriandrum*. 12, Vertical section of the globose fruit, showing the minute embryo.

1. SANIC'ULA. SANICLE.

Flowers polygamous. Calyx teeth leafy, tube bristly. Petals obovate, erect, with the point inflected. Fruit roundish, armed with hooked prickles. Carpels without ribs.—4 Umbel with a few capitate umbellets. Involucre of few cleft bracts, involucre of several, entire.

S. MARILÁNDICA. Stem 1—2f high, forked, smooth, furrowed. Radical leaves on long petioles, blade 3-parted to the base with the lateral segments 2-parted. Cauline leaves few, nearly sessile, segments oblong, cut-serrate. Involucres 6-leaved. Heads small, 2—4. Flowers mostly barren, greenish. In woods. June.

2. CRYPTOTÆNIA. HONE-WORT.

Calyx teeth obsolete. Petals with an inflexed point. Fruit linear-oblong or ovate-oblong. Seeds with 5 obtuse ribs, contracted at the sides.—4 A smooth herb with 3-parted leaves. Umbels compound, with very unequal rays, white flowers, no involucre, and few-leaved involucels.

C. CANADENSIS. St. 1—2f high, erect. Leaflets large, the side ones often 2-parted or lobed. Common in moist woods. July.

3. OSMORHIZA. SWEET CICELY.

Calyx teeth obsolete. Fruit linear-oblong, club-shaped, tapering to the base, crowned with the conical styles, carpels each with 5 equal, acute, bristly ribs, and a deep groove on the face.—4 Leaves biternately divided, with the umbels opposite. Involucre few-leaved, involucl 4—7-leaved. Flowers white. Fruit an inch in length. Hight about 2f.

Stys. thread-like, nearly as long as ovary. Plant downy. N.M. O. LONGISTYLIS. Styles conical, 5 times shorter than ovary. Plant hairy. N.M. O. BREVISTYLIS.

4. CONIUM. POISON HEMLOCK.

Calyx teeth obsolete. Fruit ovate, flattened on the sides, each carpel with 5 wavy-crenulate ribs on the back, and a deep narrow groove on the inner face.—2 Herbs with large, decompound leaves, with very many leaflets. Involucre and involucels of 3—5 leaves, the latter one-sided. Flowers white.

C. MACULATUM. Stem spotted with purple, glaucous, about 4f high. Leaves bright green, leaflets small, lanceolate, pinnatifid. Umbels terminal, the involucels with the inner half wanting. June, July.

5. CICUTA. WATER HEMLOCK.

Calyx 5-toothed. Petals with the point inflected. Fruit roundish, a little contracted on the sides so as to appear somewhat double. Seeds with 5, flattish, equal ribs, 2 of them on the margin.—4 Poisonous herbs with compound leaves and perfect umbels of white flowers. Involucre few-leaved or 0. Involucels many-leaved.

1. *C. MACULATA*. *Spotted Water-Hemlock*. Stem streaked with purple, 3—6f high, smooth, striate, hollow. Lower leaves triternate and tripinnate, segments lanceolate, serrate. Umbels 2'—4' broad. Fruit 10-ribbed. Involucels of 5 or 6 short, slender, acute bracts. Common in wet meadows. *July, Aug.*

2. *C. BULBIFERA*. *Narrow-leaved Water-Hemlock*. Stem green, striate, slender, with little bulblets in the axils of the branches. Leaves biternately divided. Leaflets linear or lance-linear, 2'—4' long, with distant teeth. In wet meadows and swamps. *Aug.*

6. THASPIUM.

Calyx minutely 5-toothed. Fruit elliptical, roundish across, not flattened either way, seeds each with 5 winged ribs.—4 Leaves divided. Involucre none, involucels few-leaved. The species resemble the *Zizias* except in their fruit. *May—June.*

1 Root leaves simple, cordate, stem leaves once-ternately divided....2

1 Lvs. bi- or tri-ternate, lfts. cut-serrate. St. hairy at joints... *T. BARBINODE.*

2 Fruit oval. Flowers yellow. Stem 2—3f high..... *T. AUREUM.*

2 Fr. roundish. Fls. dark purple. Stem 2—3f high. *S. M. T. ATROPURPUREUM.*

7. ZIZIA. GOLDEN ALEXANDERS.

Calyx minutely 5-toothed. Fruit oval or ovate, flattened at the sides so as to appear somewhat double. Seeds each with 5 ribs which are not winged, but thread-like.—4 Smooth, with divided leaves and yellow flowers. Umbels compound, with no involucre and few-leaved involucels. *May—June.*

Root leaves simple, cordate; stem leaves ternate, all serrate..... *Z. CORDATA.*

Root leaves once-ternate, upper leaves bi-ternate, all serrate..... *Z. AUREA.*

Root and stem leaves bi- and tri-ternate, leaflets entire..... *Z. INTEGRIRIMA.*

ORDER 69. CORNACEÆ.—CORNELS.

Trees and shrubs, seldom herbs, with simple, mostly opposite leaves, with flowers 4-parted, arranged in cymes, the 4 petals valvate in the bud, and with the 4 stamens standing on the top of the 2-celled ovary, which is adherent to the calyx tube. Styles united, fruit a 2-celled drupe.

CORNUS. CORNEL. DOGWOOD.

Characters of the genus indicated in that of the Order.

- 1 Flowers in cymes with no involucre. Shrubs. (7 species—omitted.)
 1 Flowers in close clusters surrounded by a 4-leaved white involucre....2
 2 A small tree (20—30f). Invol. 3' broad, very showy. Lvs. ovate. C. FLORIDA.
 2 A sm. herb (3—5' high). Invol. 1' broad. Lvs. 6 (and 4). N.M.C. CANADENSIS.

CHAPTER II.

OF THE MONOPETALOUS EXOGENS.

Essential Character.—Flowering plants (PHÆNOGAMIA) with their stems growing by additions to the outside in layers (EXOGENS), their seeds inclosed in a seed-vessel or pericarp (ANGIOSPERMS), their flowers with a double perianth and their petals united (MONOPETALÆ).

ORDER 71. CAPRIFOLIACEÆ.—HONEYSUCKLES.

Shrubs and *herbs*, often twining, with opposite leaves, with *flowers* clustered and often fragrant, 5-parted and often irregular, *corolla* monopetalous, tubular or rotate, *stamens* inserted on the tube of the corolla often one less than its lobes; *ovary* adherent to the calyx, *style* 1, *fruit* a berry, drupe or capsule; *embryo* small, in fleshy albumen.

ANALYSIS OF THE GENERA.

- 1 Corolla tubular. Stigma capitate, on a slender style....2
 1 Corolla rotate, deeply 5-lobed. Stigmas 3, rarely 5, sessile. Shrubs....5
 2 Herbs....3
 2 Shrubs....4

- 3 Stamens 4, capsule 3-celled. A trailing evergreen. *Twin-fl.*....LINNÆ'A. 1
 3 Sta. 5, drupe bony, 3—5-celled. Erect, unbranched. *Fever-root*. TRIÓSTEUM.
 4 Cor. bell-shaped, reg'r. Berry glob., 4-celled, 2-seeded.. SYMPHORICÁRPUS. 2
 4 Cor. tubular, lobes unequal. Berry 2—3-celled, few-seeded. c.. LONICÉRA. 3
 4 Corolla funnel-shaped. Capsule 2-celled, many-seeded. c.... DIÉRVÍLLA. 4
 5 Leaves pinnate. Berry globose, pulpy, 3-seeded. c.....SAMBŮCUS. 5
 5 Leaves simple. Drupe flattish, one-seeded. c.....VIBŮRNUM.

1. LINNÆ'A. TWIN-FLOWER.

Calyx tube ovate, limb 5-parted, deciduous, with 2 bractlets at base. Corolla bell-shaped, limb a little irregular, 5-lobed. Stamens 4, 2 longer than the other 2. Capsule 3-celled, but only 1-seeded, 2 of the cells being empty.—A trailing evergreen herb, dedicated to Linnæus, the first and greatest of botanists.

L. BOREÁLIS. The only species, a fine little plant, found in moist woods in cool climates. It has long, thread-like, creeping stems, rooting at the joints, the upright branches about 3' high. Leaves small, roundish. Flowers in pairs, rose-colored, nodding, at the top of the slender stalk. *June*.

2. SYMPHORICARPUS. SNOW-BERRY.

Calyx tube globose, limb 4—5-toothed. Corolla bell-shaped, 4—5-lobed, regular. Stamens 4—5, short. Fruit a globose berry, 4-celled but only 2-seeded, 2 cells being empty.—Small erect shrubs with oval, entire leaves, rose-white flowers in short clusters.

- 1 Stamens and style included (i. e. not longer than the corolla)....2
 1 Stamens and bearded style exserted (extending out of the corolla)....3
 2 Fls. in loose, leafy racemes. Berries snow-white, large. *Cult.*. S. RACEMÓSUS.
 2 Fls. in dense, nodding spikes. Ber'es white. *Wolf-berry*. N-W. S. OCCIDENTÁLIS.
 3 Flowers in axillary heads. Berries red. *Coral-berry*. M.S.W.. S. VULGARIS.

3. LONICÉRA. HONEYSUCKLE.

Calyx tube globular, limb 5-toothed, very short. Corolla tubular or funnel-form, limb 5-cleft, irregular or almost regular. Stamens 5. Ovary 2 or 3-celled. Berry few-seeded.—Climbing or erect shrubs, with opposite and often connate leaves (that is, their bases growing together around the stem), entire on the margins.

- 1 Stem climbing, flowers sessile, whorled (in pairs in one species)....2
- 1 Stem mostly erect, leaves never connate, flowers in pairs....8
- 2 Upper pair or pairs of leaves united (connate) at base....3
- 2 Leaves all distinct, corolla ringent. (In gardens only.)....7
- 3 Corolla tube gibbous (swelled out on one side) at base, limb ringent....6
- 3 Corolla tube equal and slender (not gibbous) at the base....4
- 4 Corolla ringent, lower lip linear, upper 4-lobed....5
- 4 Corolla trumpet-shaped, nearly regular, scarlet.....L. SEMPERVIRENS.
- 5 Fls. in a terminal, 2 (or more)-whorled spike, bright yellow....L. FLAVA.
- 5 Flowers in terminal and axillary whorls, reddish white.....L. GRATA.
- 5 Fls. in a single, terminal whorl, red, yellow and white....L. CAPRIFOLIUM.
- 6 Lvs. oblong, smooth and glauc. beneath. Fls. 1' long, yellow. L. PARVIFLORA.
- 6 Lvs. broad-oval, hairy and downy, green. Fls. sulphur-yellow...L. HIRSUTA.
- 7 Fls. whorled, capitate, red and yel'w. Lvs. deciduous. L. PERICLYMENUM.
- 7 Fls. in pairs, axillary and terminal. Leaves evergreen.....L. JAPONICUM.
- 8 Cor. gibbous at base, lobes more or less irregular. Wild....9
- 8 Cor. not gibbous, lobes spread, equal. Lvs. cordate, obtuse.† L. TARTARICUM.
- 9 Cor. lobes short, erect, nearly equal. Berries red.....L. CILIATA.
- 9 Cor. deeply ringent. Peds. long. Berries double, purple. L. OBLONGIFOLIA.
- 9 Cor. deeply ringent. Peds. very short. Berries double, blue. L. CÆRULEA.

4. DIERVILLA. BUSH HONEYSUCKLE.

Calyx tube oblong, limb 5-cleft, corolla twice as long, limb 5-cleft and nearly regular. Stamens 5. Capsular fruit 2-celled, many-seeded.—Small erect shrubs with opposite leaves and axillary flowers.

D. TRIFIDA. Stem about 2f high, branching. Leaves ovate, serrate, ending in a long narrow point. Peduncles 1—3-flowered, the ovaries slender, about half as long as the greenish-yellow corolla. Hedges and woods. June.

5. SAMBUCUS. ELDER.

Calyx small, 5-parted. Corolla regular, rotate, 5-cleft into obtuse lobes. Stamens 5. Stigmas sessile. Berry globose, pulpy, 3-seeded.—Shrubs (5—6f high) or perennial herbs with pinnate or bipinnate leaves. Flowers (white) in cymes.

Lvs. nearly 2-pinnate. Cymes flat. Ber. dark-purp. Sweet. June. S. CANADENSIS.
Lvs. once-pinnate. Cymes oblong, paniced. Ber. red. Red. May...S. PUBENS.

ORDER 72. RUBIACEÆ.—MADDERWORTS.

Plants with opposite (sometimes whorled) entire *leaves*, the *stipules* between the petioles, the *calyx* adherent to the ovary (often not so), the *corolla* regular, the *stamens* (3—5) on the corolla and as many as its lobes, the *fruit* various and *seeds* with abundant albumen.

ANALYSIS OF THE GENERA.

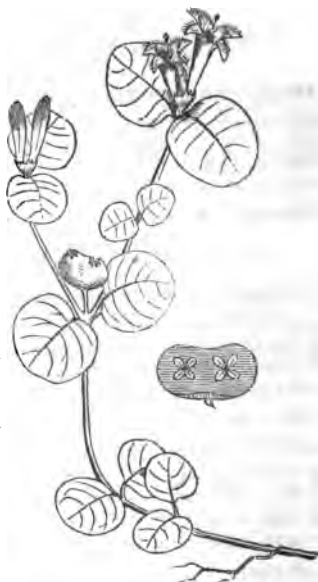
- 1 Plants not found (unless cultivated) north of Florida (9 genera omitted.)
- 1 Plants native in the Northern, Southern, Middle or Western States....2
- 2 Ovary (inferior) adherent to the calyx tube....3
- 2 Ovary (superior) free from the calyx. Herbs with opposite leaves....6
- 3 Leaves opposite, with small stipules between the petioles....4
- 3 Leaves whorled. Herbs slender, with square stems. *Clivers*...GALIUM.
- 4 Herb creeping, with twin flowers and double red berries.....MITCHELLA. 1
- 4 Herbs with the flowers and ovaries single....5
- 4 Shrubs 6f high, with the fls. in globose heads. *Button-bush*. CEPHALANTHUS.
- 4 Tree small, with small cymes of large tubular, purplish fls. S. PINCKNEYA.
- 5 Capsule 2-celled, many-seeded. Flowers 4-parted.....HEDYOTIS. 2
- 5 Carps. 2, 1-seeded, separat., one open, the other closed. W.S. SPERMATOCÉE.
- 5 Carpels 2, 1-seeded, separating, neither of them opening. W. S...DIODIA.
- 6 Fls. 4-parted, very small, white. Lvs. linear-awl-shaped. S..POLYPRÉMUM.
- 6 Flowers 5-parted, small, white, in terminal coiled racemes. S..MITREOLA. 3
- 6 Fls. 5-parted, large (2' long), scarlet, tubular. *Pink-root*. W. S...SPIGELIA.

1. MITCHELLA. PARTRIDGE-BERRY.

Flowers 2 on each double ovary. Calyx 4-parted. Corolla funnel-shaped, hairy within. Stamens 4, short, inserted on the corolla. Stigmas 4. Berries composed of the 2 united ovaries.—Smooth, trailing, evergreen herbs. Lvs. round-ovate, petiolate with minute stipules. Flowers white or rose-white. Berries bright red.

M. REPENS. Common in woods, everywhere. Stems a foot or so in length. Flowers in June, fragrant. Berries remaining through the winter.

Fig. 233. *Mitchella repens*, whole plant, with flowers and fruit. *a*, cross section of the double fruit, showing the two ovaries.



2. HEDYOTIS.

DWARF-PINK. BLUETS.

Calyx tube ovate, limb 4-parted, corolla 4-lobed. Stamens 4, inserted on the corolla. Stigma 2-lobed. Capsule 2-celled, many-seeded.— Small herbs (rarely shrubs) with opposite leaves and small stipules united to the petiole.

- 1 Corolla salver-form. Plants very delicate, the peduncles 1-flowered....2
- 1 Corolla funnel-form. Flowers in little cymes. Leaves near 1' long....5
- 1 Corolla wheel-shaped, much shorter than the calyx. Fls. axillary....7
- 2 Stems erect, forked. Leaves spatulate, tapering to the slender base....3
- 2 Stems creeping. Leaves roundish, abrupt at base, on short stalks....4
- 3 Plant 1'—3' high. Peduncles mostly shorter than the leaves... *H. MINIMA*.
- 3 Plant 3'—7' high. Peduncles much longer than the leaves... *H. CÆRULEA*.
- 4 Peduncles terminal, 1'—2' long. Leaves round-ovate.... *H. SERPYLLIFOLIA*.
- 4 Peduncles axillary mostly, shorter than the round-oval lvs. *H. ROTUNDIFOLIA*.
- 5 Leaves narrow, lance-linear, with one visible vein....6
- 5 Lvs. lance-ovate, 3—5-veined. Fls. white (or purple). *W*.... *H. PURPUREA*.
- 6 Stem 4'—6' high. Lvs. mostly radical, obtuse. *M. W*..... *H. CILIOLATA*.
- 6 Stem 5'—10' high. Lvs. cauline, acute at each end. *N. W*.... *H. LONGIFOLIA*.
- 6 St. 1—2½' high. Lvs. very narrow-lin. Caps. top-shaped. *S. W. H.* *STENOPHYLLA*.
- 7 Leaves linear, 1' long. Calyx teeth spreading on the fruit. *S. H.* *BOSCH.*
- 7 Leaves lance-oblong. Calyx teeth erect on the fruit. *M. S.* *H. GLOMERATA*.

3. MITRE'OLA. FALSE MITREWORT. SOUTHERN MITREWORT.

Calyx 5-parted. Corolla between urn- and funnel-shaped, throat bearded, limb 5-lobed. Stamens 5, included. Styles 2, separate at base, united above. Capsule more than half-superior, 2-horned, mitre-shaped.—① Smooth. Stems 1—2f high. Leaves opposite. Fls. small, white, in terminal racemes which uncoil as they blossom. S.

Leaves lance-oval, petiolate, 1'—3' long.....M. PETIOLATA.

Leaves round-ovate, sessile, $\frac{1}{2}$ '—1' long.....M. SESSILIFOLIA.

ORDER 75. COMPOSITÆ.—ASTERWORTS.

An immense family of *herbs* or *shrubby plants*, with *compound flowers*, that is, the *flowers* (or *florets*) collected into close *heads* upon a common receptacle, and surrounded by an *involucre* of many bracts (called *scales*), with 5 *stamens* which have their anthers united into a tube around the style, with the *calyx tube* closely adhering to the 1-celled ovary (an *achenium* in fruit), and the *calyx limb* crowning the ovary in the form of a *pappus* consisting of scales, awns, bristles or hairs, or else entirely wanting; the *corolla* consisting of 5 united petals, either strap-shaped (ligulate) or tubular, and the *style* 2-cleft at the top.

In this Order the pupil will remember that the *heads* are called *radiate*, when the outer florets only have *rays* or are *ligulate* (see the figure 234, 1), *radiant*, when all the florets are ligulate (figure 7), *discoid*, when all the florets are tubular, there being no rays (fig. 12). The *receptacle* is the broad top of the stalk on which the florets sit (fig. 2). It is *chaffy* when there are scales or bracts growing among the florets, and *naked* when there are no such scales.

The tubular florets constitute the *disk*, and the ligulate, if any, the *ray*; the disk is generally *yellow*, while the ray is about as often *cyanic* (that is, blue, red, white, or *any* color except yellow) as yellow.

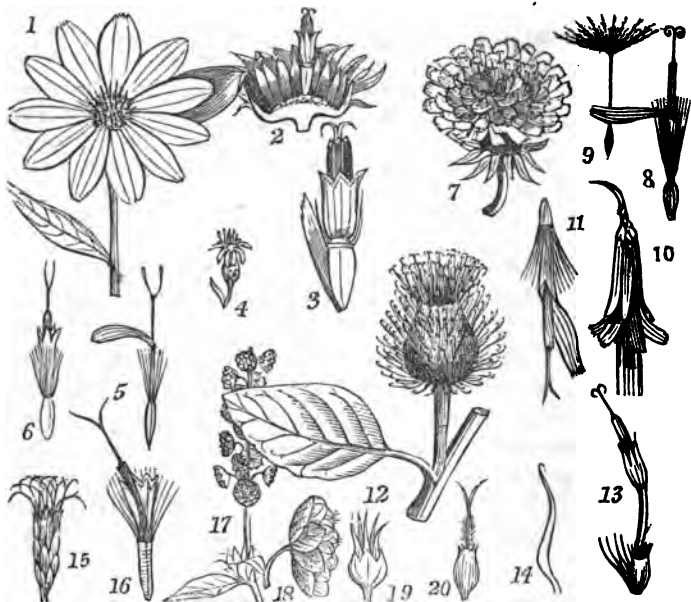


Fig. 234. 1. *Helianthus strumosus*—head radiate. 2. Vertical section of the head, showing the scales of the involucre, and a single disk-flower remaining upon the convex receptacle. 3. A perfect disk-flower magnified, showing the achenium, the 2 awns of the pappus, the 5-toothed tubular corolla, the 5 stamens united around the branched style, and the chaff-scale at base. 4. Head (radiate) of *Solidago cæsia*. 5. A pistillate, ligulate flower of the ray. 6. A perfect disk-flower. 7. A (radiant) head of *Taraxacum Dens-leonis*. 8. A perfect, ligulate fl. 9. Achenium, with its long beak and feathery pappus. 10. A (radiant) head of *Nabalus altissimus*. 11. A flower. 12. *Lappa* (Burdock), head discoid. 13. A flower. 14. One of the hooked scales. 15. A (discoid) head of *Eupatorium purpureum*. 16. A flower. 17. *Ambrosia* (Pig-weed). 18. Staminate head enlarged. 19. Pistillate involucre enlarged. 20. The fertile flw'r.

ANALYSIS OF ALL THE GENERA IN THE UNITED STATES

(Except those with discoid heads.)

- 1 Heads of florets discoid (no rays)....(many genera, but all omitted.)
- 1 Heads radiate, with yellow rays....2
- 1 Heads radiate, with cyanic rays....3
- 1 Hds. radiant, florets all ligulate and perfect. Plants with a milky juice. 4

- 2 Leaves alternate or scattered on the leafy stems....8
- 2 Leaves opposite or whorled on the stems, or all radical....10
 - 3 Leaves alternate or scattered on the leafy stem....11
 - 3 Leaves opposite or whorled on the leafy stem....35
 - 3 Leaves all radical and the flowers on a scape....36
- 4 Flowers bright yellow....5
- 4 Flowers white, cream-color or purplish....7
- 4 Flowers blue. Stems leafy, erect....41
 - 5 Pappus none. Involucre of about 8 equal scales....37
 - 5 Pappus double, the outer of scales, inner of bristles....38
 - 5 Pappus wholly of hair-like bristles, generally abundant....6
- 6 Fruit bearing the pappus on its slender beak....39
- 6 Fruit not lengthened into a beak, pappus sessile....40
 - 7 Pappus consisting of equal, feather-like bristles....42
 - 7 Pappus of simple, hair-like bristles, abundant....43
- 8 Receptacle chaffy (with bracts growing among the florets)....9
- 8 Receptacle with deep, horny cells, like a honey-comb....19
- 8 Receptacle not chaffy, flat or merely convex....15
- 8 Receptacle not chaffy, conical or globular....20
 - 9 Rays sterile, disk fertile. Receptacle conical or columnar....21
 - 9 Rays sterile, disk fertile. Recp. flattish. Fr. flattened on the sides....22
 - 9 Rays fertile, disk sterile. Recp. flat. Fr. flattened same way as scales....23
- 10 Receptacle chaffy. Rays sterile, disk fertile....26
- 10 Receptacle chaffy. Rays fertile, disk sterile....27
- 10 Receptacle chaffy. Rays fertile, disk perfect....28
- 10 Receptacle naked or destitute of chaffy scales....24
 - 11 Receptacle not chaffy, naked of scales....12
 - 11 Receptacle chaffy with scales among the florets. Lvs. finely divided....33
 - 11 Receptacle chaffy with scales, &c. Lvs. undivided, merely toothed....34
- 12 Pappus of numerous bristly hairs....13
- 12 Pappus of 2 or 3 awns and minute hairs. Glabrous plants....31
- 12 Pappus wholly wanting, or only a membranous margin....32
 - 13 Involucre of unequal scales, imbricated in several rows....14
 - 13 Involucre scales nearly equal, narrow, and almost in one row....31
- 14 Pappus simple, the bristly hairs abundant and about equal....29
- 14 Pappus double, the outer row of hairs extremely short....30

- 15 Involucre scales imbricated in several rows....16
 15 Involucre not imbricated, the outer scales very short or none..SENÉCIO.
 15 Invol. not imbr., outer scales equal to the inner. *Marigold*. CALÉNDULA.
 15 Involucre not imbricated, outer scales longer than inner. *S.* GAILLÁRDIA.
 16 Pappus simple, the bristles all equal and of one kind....17
 16 Pap. d'ble, the outer very short and chaffy. Lvs. entire. *W.S.* CHRYSÓPSIS.
 16 Pap. double in the disk, none in the rays. Lvs. toothed. *S.* HETEROTHÈCA.
 17 Heads small, rays few (2—15)....18
 17 Heads quite large, rays narrow, about 30. Tall. *Elecampane. c.* IN'ULA.
 18 Pap. scaly, very short. Root lvs. cordate. Rays 4 or 5. *S.* BRACHYCHÆTA.
 18 Pap. abundant bristly hairs. Rt. lvs. not cordate. Pedicels short. *SOLIDAGO*. 1
 18 Pap. of a single row of equal bristly hrs. Ped'cls long, slender. *S.* ISOPÁPPUS.
 19 Involucre about 4-rowed. Rays 20—30. Head solitary. *S.* BALDWINIA.
 19 Invol. about 2-rowed. Rays 8—10. Hds. corymbed. *S.* ACTINOSPÉRMUM.
 20 Ray florets pistillate. Leaves decurrent. *Sneezwort*.....HELENÍUM.
 20 Ray florets neutral. *False Sneezwort*.....LEPTÓPODA.
 21 Fruit (achenia) 4-angled. Heads large, showy. *Cone-flower*. RUDBÍCKIA.
 21 Fruit flattened, winged. Heads showy. Rays droop. *W. S.* LÉPACHYS.
 22 Achenia wingless. Pappus of 2 deciduous scales. *Sun-flower*. HELIÁNTHUS. 2
 22 Ach. winged. Pappus of 2 persist. awns. Lvs. often decurrent. ACTINÓMERIS.
 23 Ach. wingless, in more than 1 row. Coarse pls. with large hds. SÍLPHIUM.
 23 Ach. winged, in only 1 row. Small, with middling hds. *S.* BERLANDIÈRA.
 24 Stems leafy, erect, about 2f (or 1—3f) high....25
 24 Stemless plants, lvs. radical, appearing after heads. *Colts-foot*. TUSSILÁGO.
 25 Scales 5, united in 1 row. Leaves pinnate. *French Marigold*...TAGÈTES.
 25 Scales in 2 rows, the outer united. Leaves pinnate. *W. S.*...DYSÓDIA.
 25 Scales in 1 or 2 rows, all distinct. *W. S.*.....AR'NICA.
 26 Invol. imbricated in 3 or more rows of scales. *Sun-flower*...HELIÁNTHUS. 2
 26 Invol. 2-rowed. Pappus of downwardly hispid awns. *Burr Marigold*. BIDENS. 3
 26 Invol. 2-rowed. Pap. upwardly hispid if at all. *Tick Sun-flower*. COREÓPSIS. 4
 27 Ach. wingless. Rays 5—12. Herbs viscid, 2—10f high. *S.*...POLÝMNIA.
 27 Ach. wingless. Rays 5. Hbs. 2'—10' high, at first stemless. *W.S.* CHRYSÓGONUM.
 27 Ach. broadly winged. Rays 12—25. Coarse, tall hbs. *S-W.M.* SÍLPHIUM.
 28 Herbs 3—6f high. Rays 1—5. Receptacle flat. *S-W.*.....VERBESINA.
 28 Herbs 2—3f high. Rays 6—9. Receptacle convex. *S-W.* TETRAGONOTHÈCA.

- 28 Hbs. 2—6f high. Rays 10—15. Recep. conical. *False Sun-flower*. HELIÓPSIS.
 28 Shrubs 3—10f high, with solitary heads. *S.* BORRÍCHIA.
 29 Ach. very silky, biggest at top. Rays about 5. *False Aster*. SERICOCÁRPUS.
 29 Achenia smooth or smoothish, flattened. Rays 6—100. *Starwort*. A'STER. 5
 30 Wild plts. 1—4f high, with middle sized hds. (about 1' broad). DIPLOFÁPPUS.
 30 Garden plants 1—2f high, with very large hds. *China Aster*. CALLISTEPHUS.
 31 Herbs 2—3f high, very smooth. Leaves lanceolate, entire... BOLTÓNIA.
 31 Hbs. 4—9f high, hairy or rough. Rays 20—200. *White-weed*. ERÍGERON. 6
 32 Invol. broad and flattish. Pappus 0. Wild plts. Rays white. LEUCÁNTHEMUM.
 32 Invol. hemispherical. Pappus a membranous margin. *Cult.*. PYRÆTHRUM.
 32 Invol. hemispherical. Pappus 0. Lvs. lobed. *Cultivated*. CHRYSÁNTHEMUM.
 32 Invo. bell-shaped. Pap. 0. Lvs. spat., entire. Rays violet-purp. *W. Daisy*. BÉLLIS.
 33 Disk florets yellow, perfect. Rays pistillate. *Camomile*.... ANTHÉMIS.
 33 Disk florets yellow, perfect. Rays neutral. *May-weed*..... MARÛTA.
 33 Disk florets white, perfect. Rays pistillate. *Yarrow*..... ACHILLÆA. 7
 34 Rays short, white, 3 or 4. *W. S. Crown-beard*..... VERBESINA.
 34 Rays very short, white, 5, ear-shaped. *W. M.*..... PARTHÉNium.
 34 Rays very large, purple, pendulous. *Purple Cone-flower*..... ECHINÆA.
 35 Leaves pinnately divided. Inner involucre of 8 united scales.† DÁHLIA.
 35 Leaves simple. Receptacle conical with large chaff.†..... ZINNIA.
 35 Lvs. simple. Receptacle flat. Rays rose-color. *Tick-seed*... COREÓPSIS. 4
 35 Lvs. simple. Receptacle flat. Rays white, short. *W.*..... ECLÍPTA.
 36 Heads in corymbs. Disk florets regularly 5-toothed. *r.*..... NARDÓSMIA.
 36 Heads solitary. Disk florets regularly 5-toothed. *S.*..... BÉLLIS.
 36 Hds. solitary. Disk fits. 2-lipped, outer lip 3-toothed, inner 2. *S.* CHAPTÁLIA.
 37 Leaves all alternate. Heads paniced. *r.*..... LAMPSANA.
 37 Leaves partly opposite. Heads solitary or umbel. *S.*..... APÓGON.
 38 Lvs. all rad'l., pinnatifid-toothed. Pap. scales 5, with 5 bristles. *c.* KRÍGIA.
 38 Lvs. all or mostly rad., seldom pinn. Pap. scales and bristles many. CÝNTHIA.
 39 Stemless leaves runcinate. Pappus white. *Dandelion*.... TARÁXACUM. 8
 39 Stems leafy or not. Pappus reddish or tawny. *S.*..... PYRRHOPÁPPUS.
 39 Stems leafy, leaves runcinate.* Pappus silky-white. *c.*..... LACTÛCA.
 40 Pappus brownish. Stems mostly leafy, with many heads. *c.* HIERÁCIUM. 9
 40 Pappus silky white. Stemless; scapes each with one head. *W.* TRÓXIMON.
 40 Pappus silky white. Stems bearing prickly leaves. *c.*..... SÓNCHUS.

- 41 Pappus of many small scales. Branched stems 2f high. *c. E. CICHORIUM.*
 41 Pappus of many hair-like bristles. Sts. 3—8f high. *W.S.M. MULGEDIUM.*
 42 Leaves on the stem linear, entire. Flowers purplish.†.... *TRAGOPOGON.*
 42 Lvs. all radical, toothed. Flowers white. Fruit taper-beaked. *LEONTODON.*
 43 Achenia with a long beak, pappus silk-white. Heads erect. *c. LACTUCA.*
 43 Ach. not beaked, pappus dull-white. Hds. mostly nodding. *c... NABALUS.*
 43 Ach. not beaked, pap. dull-white. Hds. erect, purple. *S. r. LYGODESMIA.*

1. SOLIDAGO. GOLDENROD.

Heads few-flowered, the rays 1—15, pistillate, disk-florets perfect. Involucre oblong, imbricate, with close-pressed scales. Receptacle alveolate, narrow. Pappus simple, of equal, hair-like, rough bristles.—Herbs very abundant in the United States. Stem erect, branching near the top. Leaves alternate. Heads small, florets all yellow (in *S. BICOLOR* whitish,) opening from August to October.

- 1 Shrub woody, 1—3f high. Hds. with 1—3 rays. *S....* 29
 1 Herbs. Heads without rays (discoid).... *S....* 13
 1 Herbs. Heads with rays (1—15, generally small).... 2
 2 Scales of the involucre with recurved, leafy, green tips.... 14
 2 Scales of the involucre erect, tips scarcely at all green.... 3
 3 Heads (white or yellow) in axillary, close clusters or short racemes.... 15
 3 Heads in terminal racemes forming a close or a spreading panicle.... 4
 3 Heads in terminal compound corymbs.... 12
 4 Racemes erect, not one-sided. Leaves feather-veined.... 5
 4 Racemes spreading or recurved, the flowers all on one side.... 7
 5 Alpine species (growing only on mountains). Heads quite large.... 16
 5 Not alpine—growing in plains or low grounds. Heads not large.... 6
 6 Plants very smooth, at least the stem and leaves. Rays 4—7.... 17
 6 Plants downy or hoary with very close soft hairs. Rays 9—12.... 18
 7 Leaves all very entire, smooth and fleshy.... 21
 7 Leaves serrate or serrulate, sharply or bluntly.... 8
 8 Leaves distinctly 3-veined, narrow-lanceolate.... 9
 8 Leaves feather-veined, and sometimes obscurely 3-veined.... 10
 9 Stem downy or hairy, roughish.... 22
 9 Stem smooth and glabrous, often glaucous.... 23
 10 Stem downy or hairy, rough or grayish. Leaves rough or not.... 28
 10 Stem smooth and glabrous. Leaves smooth or rough.... 11
 11 Rays 6—12. Racemes close, forming a compact panicle.... 24
 11 Rays 6—12. Racemes distant, loosely or scarcely panicle.... 26
 11 Rays 2—5. Racemes, or the panicle, long and slender.... 27

- 12 Leaves lanceolate, large. Stem smooth.... 19
 12 Leaves lanceolate, large. Stem rough-downy.... 20
 12 Leaves linear, entire. Stems much branched, smoothish.... 29
 13 Disk florets 10—15. Racemes erect, panicle slender..... S. DISCOIDEA.
 13 Disk fts. 5—7. Rac. spreading, one-sided, pan. slend. S. S. BRACHYPHYLLA.
 14 Rays 12—15. St. smooth below. Rt. lvs. broad, oval, petiol. N. M. S. S. SQUARROSA.
 14 Rays 9—11. Stem finely downy. Root lvs. small, sessile. S. S. PETIOLARIS.
 15 Plant hairy, with (mostly) white heads and lance-oblong lvs. S. BICOLOR.
 15 Plant smoothish, with large, broad-lanceolate leaves..... S. LATIFOLIA.
 15 Plant smooth and glabrous, tall and slender. Lvs. lance-linear. S. CÆ'SIA.
 16 Lvs. broad-ovate, abruptly narrowed into a winged petiole. N. S. THYRSOIDEA.
 16 Lvs. broad-lanceolate, tapering into a winged petiole. S.... S. GLOMERATA.
 16 Lvs. narrow, blunt-serrate. Hds. 1—12, very large. Scales acute. S. VIRGAUREA.
 16 Lvs. narrow, blunt-serrate. Hds. many, paniced. Scales obtuse. S. HUMILIS.
 17 Branches and stalks downy. Lvs. oval. Hds. large, handsome. S. SPECIOSA.
 17 Smooth all over, straight, slender. Lvs. lanceo., blunt-serrate. N. S. STRICTA.
 17 Smooth all over, very slender. Leaves small, entire. S. M... S. VIRGATA.
 18 Root lvs. spatulate, stem lvs. lanceolate. Scalesawl-shaped... S. PUBERULA.
 18 Root lvs. spat., stem lvs. short-obovate. Scales linear. S. S. PULVERULENTA.
 18 Rt. lvs. ovate, abruptly narrowed into a winged petiole. May. Jn. S. S. VERNA.
 19 Smooth all over. Lvs. obtuse, flat. Heads all corymbd. W. S. OHIENSIS.
 19 Br'nchs, &c. dust-downy. Lvs. acute, concave. Hds. corym. W. S. RIDDÉLLII.
 19 Br'nchs & stalks hairy-downy. Corymb form'd of racemes. S. S. CORYMBOSA.
 20 Stem stout, 3—4½ high. Lvs. stiff and rough. Hds. very large... S. RIGIDA.
 20 Stem in tufts, not 1½ high. Lvs. sharp-serrate. Mounts. S. S. SPITHAMÆA.
 21 Lvs. lanceo., obscurely 3-veined, thick. Hds. large. E... S. SEMPERVIRENS.
 21 Leaves lance-linear, 1-veined, thick. Heads small. S. S. ANGUSTIFOLIA.
 21 Leaves lance-linear, veinless, dotted. Plant sweet-scented.... S. ODORA.
 22 Leaves smooth and glabrous, serrate. Racemes short. W.... S. SHORTII.
 22 Lvs. downy beneath, rough above, serrate. Rac. rather long. S. CANADENSIS.
 23 Stem 3—6½ high. Lvs. roughish above, veins beneath hairy. S. SEROTINA.
 23 Stem 3—8½ high. Lvs. quite smooth both sides. Hds. largish. S. GIGANTEA.
 23 Stem 1—2½ high, slender. Lvs. smooth, lance-linear. W. S. MISSOURIENSIS.
 24 St. very leafy. Panicle dense, tapering upward. Rays showy. S. ELLIPTICA.
 24 St. very leafy. Pan. dense, tapering upward. Rays short. S... S. ELLIOTII.
 24 Stem few-leaved. Root lvs. large. Panicle somewhat level-topped.... 25
 25 Racemes long, recurved, panicle broad. Petioles all winged... S. ARGUTA.
 25 Rac. short, suberect, panicle narrow. Rt. petioles not wing'd. S. NEGLÉCTA.
 26 Leaves large, thick, very rough on the upper side..... S. PATULA.
 26 Leaves large, thin, smooth both sides..... S. MUHLENBÉRGIA.
 27 Disk florets 8—12. Lower lvs. long-stalked. Panicle loose... S. BOOTHII.
 27 Disk fts. 3—5. Lvs. elliptic-ovate. Rac. few, long, spreading. S. ULMIFOLIA.
 27 Disk fts. 3—5. Lvs. lanceolate. Racemes short. Plant small. S. LINOIDES.
 27 Disk fts. 3—5. Lvs. linear, subserrate. Plant 2—3½ high. S. S. TORTIFOLIA.

- 28 Leaves coarsely serrate, very veiny. Stem stout, 2—7f high... *S. ALTISSIMA*.
 28 Leaves finely serrate, nearly veinless. Stem stout, 3—7f high... *S. PILOSA*.
 28 Lvs. blunt-serrate or entire, grayish. Stem 1—2f high.... *S. NEMORALIS*.
 29 Rays 15—20, minute. Lvs. lance-linear, 3—5-veined.... *S. LANCEOLATA*.
 29 Rays 10—12, minute. Lvs. narrow-linear, 1-veined.... *S. TENUIFOLIA*.
 29 Rays 1—3. Lvs. lanceol. Hds. paniced. Shrub. S... *S. PAUCIFLOSCULOSA*.

2. HELIANTHUS. SUNFLOWER.

Heads many-flowered, rays neutral, disk florets perfect. Scales of the involucre in several rows, more or less imbricated. Receptacle flat or convex, the chaff persistent, embracing the 4-sided, flattened achenia. Pappus of 2 chaffy awns, deciduous.—Herbs mostly 4, rough. Leaves opposite, the upper often alternate, mostly 3-veined. Heads mostly large (the disk $\frac{1}{4}$ —12' broad), rays yellow, disk yellow or purple. *July—Oct.*

- 1 Corollas of the disk dark purple.... 2
 1 Corollas of the disk yellow.... 3
 2 Involucre scales short, regularly imbricated, not leafy.... 8
 2 Involucre scales irregularly and loosely spreading.... 7
 3 Leaves nearly all opposite and 3-veined.... 4
 3 Leaves nearly all alternate and feather-veined.... 10
 4 Scales of the involucre short, close, regularly imbricated.... 9
 4 Scales of the involucre loose, irregular, the outer often leafy.... 5
 5 Heads small (disk $\frac{1}{4}$ ' broad), with 5—10 rays.... 11
 5 Heads large (disk about 1' broad), rays 8—15.... 6
 6 Scales of the invol. lance-linear, tapering, longer than disk. Lvs. thin.... 12
 6 Scales of the invol. ovate-lanceolate, about as long as disk. Lvs. thick.... 13
 7 Plant annual, cultivated. Heads very large.† *common*..... *H. ANNUUS*.
 7 Perennial, wild. Lvs. lance-linear. Hds. small. *M.S.H. ANGUSTIFOLIUS*.
 8 Rays 7—10, very short, sometimes none. Leaves broad. S.... *H. RÁDULA*.
 8 Rays 12—16, long. Head only one. Lvs. of two forms. S. H. *HETEROPHYLLA*.
 8 Rays 12—16, long. Hds. several. Lvs. obtuse at each end. S. H. *ATROBÆNE*.
 8 Rays 20—24, long. Lvs. very stiff and rough, acute or pointed. W. H. *RIGIDUS*.
 9 Plant rough, green. Lvs. serrate, on short petioles. W.... *H. LETIFOLIUS*.
 9 Plant rough, green, nearly leafless above. Pet. long. W. H. *OCCIDENTALIS*.
 9 Plant grayish-downy. Lvs. sessile with a narrow base. W.... *H. CINEREUS*.
 9 Plant whitish-woolly. Lvs. sessile with a broad base. W..... *H. MOLLIS*.
 10 Leaves long-lanceolate, serrate. Stem rough and hairy.... *H. GIGÁNTÆUS*.
 10 Lvs. long-lanceo., coarse-serrate. St. smooth, glauc. W. H. *GROSSE-SERRÁTUS*.
 10 Leaves lance-ovate, nearly entire. Stem downy. W. S.... *H. TOMENTÓRUS*.
 10 Leaves ovate, the lower cordate. Gardens. *Artichoke*..... *H. TUBERÓRUS*.
 11 Whole plant smooth, slender, nearly simple. Rays 10. S. H. *LONGIFOLIUS*.
 11 St. smoothish, generally much branched. Rays 6. W. H. *MICROCEPHALUS*.

- 12 Tall, slender, branches nearly leafless. Lvs. serr. Rays 12-15. *W. H. TRACHELIOPHOLUS*.
 12 Tall, leafy. Lvs. ovate-pointed, coarse-serrate. Rays 9-12. *H. DECAPÉTALUS*.
 13 Lvs. petiolate, with a pointed base, slightly serrate. *H. STRUMÔSUS*.
 13 Lvs. petiolate, ovate, often cordate, large, serrate. *W. H. DORONICOIDES*.
 13 Lvs. petiolate with a rounded base. Stem bristly-hairy. *W. H. HIRSUTUS*.
 13 Lvs. sessile with a broad base, divaricate. *H. DIVARICATUS*.

3. *BIDENS*. BURR-MARIGOLD.

Involucre scales nearly equal, double, the outer generally large and leafy. Rays few (3-8, or sometimes none), neutral, disk perfect. Receptacle chaffy, flat. Achenia flattened or 4-sided, crowned with 2-4 awns which are hispid backwards.—Leaves opposite.

July—Oct.

- 1 Rays inconspicuous or none. 2
 1 Rays quite showy, yellow. 4
 2 Achenia flattened, broadest at top. 3
 2 Achenia slender, 4-sided. 5
 3 Lvs. pinnately 3-5-foliate, divisions distinct. Rays 0. *B. FRONDOSA*.
 3 Lvs. simple, lower ones sometimes 3-parted. Rays 0. *B. CONNATA*.
 3 Lvs. simple, scarcely connate. Rays sometimes present. *B. CÉRNUA*.
 4 Lvs. narrow-lanceolate, equally serrate, connate. *B. CHRYSANTHEMOIDES*.
 4 Lvs. mostly under water and very finely divided. *M.* *B. BECKII*.
 5 Heads small, with small, white rays. Lvs. pinnate. *S.* *B. LEUCANTHA*.
 5 Heads with very short yellow rays. Leaves bipinnate. *B. BIPINNATA*.

4. *COREOP'SIS*. TICK-SEED.

Involucre many-flowered, double, each of 8-13 scales, the outer leafy, the inner membranous. Receptacle flat, the chaff falling with the fruit. Achenia flattened, often winged, emarginate, each commonly with 2 teeth or awns which are not hispid downwardly as in *BIDENS*.—Leaves generally opposite. Heads showy (rarely rayless).

- 1 Heads discoid (without rays). 4
 1 Heads radiate, rays showy. 2
 2 Disk yellow, rays also yellow, mostly entire. 3
 2 Disk yellow, rays rose-colored, 3-5-toothed at the end. 11
 2 Disk purple, rays yellow with a purple base, toothed. 10
 2 Disk purple, rays wholly yellow, toothed at the end. 9
 3 Leaves petiolate, compound with lanceolate, toothed divisions. 5
 3 Leaves petiolate, compound, with linear, entire divisions. 6
 3 Leaves petiolate, simple, or some of them eared at base. 7
 3 Lvs. sessile, 3-parted, divisions entire or not often, seeming whorled. 8

- 4 Leaves on long petioles, ternately divided. *W*.....*C. DISCOIDEA*.
 4 Leaves on short petioles, toothed, lance-linear. *S. r*.....*C. BIDENTOIDES*.
 5 Leaflets 3—5. Outer scales about 8. Achenia 2—4-toothed. *S. C. AUREA*.
 5 Lfts. 5—7. Outer scales about 8. Ach. slender, 2-toothed. *C. TRICHOSPERMA*.
 5 Lfts. 5—7. Outer scales 10—13. Achenia 2 or 4-awned. *W. C. ARISTOSA*.
 6 St. 4—8f high. Hds. on short stalks. Rays $\frac{1}{4}$ ' long, entire. *W. S. C. TRIPTERIS*.
 6 St. 1—2f high. Hds. on long stalks. Rays $\frac{1}{4}$ ' long, 4—5-cleft. *S. C. GRANDIFLORA*.
 7 Stem 4—6f high. Rays entire. Leaves ovate, serrate. *S. C. LATIFOLIA*.
 7 St. 1—3f high. Rays 2—5-toothed. Lvs. often eared at base. *S. C. AURICULATA*.
 7 St. 2—3f high. Rays 4—5-toothed. Lvs. lanceolate, entire. *S. C. LANCEOLATA*.
 8 Leaf divisions all entire, appearing in 6-leaved whorls. *S. C. SENIFOLIA*.
 8 Leaf divisions all again divided into narrow-linear lobes. *W. C. VERTICILLATA*.
 8 Lvs. deeply 3-cleft, wedge-shaped, lobes linear, not whorled. *W. C. PALMATA*.
 9 Leaves sessile, 3-parted, the divisions often lobed. *S. C. DELPHINIFOLIA*.
 9 Lvs. petioled, lanceolate, sometimes divided. Stem round. *S. C. GLADIATA*.
 9 Lvs. petioled, narrow-spatulate, entire. Stem square. *S. C. ANGUSTIFOLIA*.
 9 Lvs. petioled, lance-ovate, entire. Stem round below. *S. C. INTEGRIFOLIA*.
 10 Lvs pinnately 3—5-foliolate, divisions oblong-oval, entire. \dagger . *C. DRUMMONDII*.
 10 Lvs. pinnately much divided, divisions linear, entire. \dagger*C. TINCTORIA*.
 11 Stem leafy, lvs. narrow-linear, entire. Rays rose-white. *E. C. ROSEA*.
 11 Stem few-leaved, lvs. awl-shaped, entire. Rays rose-red. *S. C. NUDATA*.

5. ASTER. STARWORT.

Heads many-flowered. Scales of the involucre generally imbricated in two or more rows, and with green tips. Disk florets tubular, perfect, rays fertile, in one row, oblong, revolute when old. Receptacle flat, marked with pits. Pappus simple, hair-like, rough. Achenium usually flattened.—A large genus of 4 herbs, very abundant in the United States, flowering in late summer and autumn. Leaves alternate. Disk florets yellow, changing to purple, rays blue, purple or white, never yellow.—The species are very variable, and many of them are hard to distinguish.

- 1 Radical and lower leaves cordate and petiolate....2
 1 Radical leaves never cordate....4
 2 Heads in loose corymbs. Rays white or whitish....8
 2 Heads in racemes or panicles, blue or bluish....3
 3 Leaves evidently serrate; rays light blue, about 12, spreading $\frac{1}{4}$ '....9
 3 Leaves entire or nearly so; rays bright blue, spreading near 1'....10
 4 Involucre scales tipped with green, or the outer ones wholly green....5
 4 Involucre scales with scarious margins or wholly scarious....7
 5 Stem leaves clasping with a cordate or auricled base....6
 5 Stem leaves sessile, rarely clasping, never cordate nor auricled....15

- 6 Invol. scales close, in several rows, outer ones gradually shorter....11
 6 Invol. scales loose, nearly equal, outer ones often wholly green....12
 7 Leaves lanceolate and linear-lanceolate, more or less rough....13
 7 Leaves linear, fleshy, very smooth, entire. Salt marsh herbs....14
 8 Slender, with thin, serrate leaves. Heads about 6-rayed....*A. CORYMBOSUS*.
 8 Stout, with large, thick serrate, rough lvs. Hds. about 13-ray. *A. MACROPHYLLUS*.
 9 Involucre scales close, obtuse. Leaves sharply serrate....*A. CORDIFOLIUS*.
 9 Invol. scales awl-shaped, long and loose. Lvs. blunt-serrate. *A. SAGITTIFOLIUS*.
 10 Stem lvs. sessile, rough, lanceolate and linear. Hds. middle size. *A. AZUREUS*.
 10 Stem lvs. sessile, rough, oblong, the lower obtuse. Hds. small. *A. ASPERULUS*.
 10 St. leaves on winged stalks with rounded clasping bases, wavy. *A. UNDULATUS*.
 10 Stem leaves on naked stalks, all cordate, pointed, entire.....*A. SHORTHII*.
 11 Plant rough-downy. Lvs. entire. Scales slender pointed.....*A. PATENS*.
 11 Plant smooth and glaucous. Scales broad, acute.....*A. LEVIS*.
 12 Lvs. sharply cut-serrate, with a long, slender, entire base. *A. PRENANTHOIDES*.
 12 Lvs. sparingly serrate, lanceolate. Stem hairy, often red....*A. PUNICEUS*.
 12 Lvs. entire, rough, numerous. Rays nearly 100, $\frac{1}{4}$ ' long. *A. NOVE-ANGLIÆ*.
 13 Lvs. coarsely toothed, long-pointed, often clustered. Rs. white. *A. ACUMINATUS*.
 13 Lvs. nearly entire, acute, with edges revolute. Hds. 1—3. *A. NEMORALIS*.
 13 Lvs. entire, stiff, acute. Hds. small, in a close corymb. *A. PTARMICOIDES*.
 14 Hds. large, with showy rays. St. flexuous. Sca. in many rows. *A. FLEXUOSUS*.
 14 Heads numerous, with very short rays in 2 rows.....*A. LINIFOLIUS*.
 14 Heads with showy blue rays. Scales in 2 or 3 rows.....*A. DIVARICATUS*.
 15 Many species, very variable, here omitted.

6. ERIGERON. FLEA-BANE. WHITE-WEED.

Heads many-flowered, mostly hemispherical, rays very numerous (20—200), narrow, linear, pistillate; disk flowers perfect. Receptacle flat, naked (no chaff or pits). Scales of the involucre nearly equal and in one row. Pappus generally simple.—Herbs with alternate leaves. Rays white, blue or reddish. Flowering from May to September.

- 1 Rays showy, longer than the involucre. Heads large ($\frac{1}{4}$ —1' broad)....2
 1 Rays obscure, shorter than the involucre, whitish. Heads very small....3
 2 Rays purple, very numerous. Heads loosely corymbed....4
 2 Rays white or whitish. Heads loosely paniced....5
 3 Stem erect, hairy. Leaves lanceolate. Heads paniced...*E. CANADENSE*.
 3 Stems prostrate, diffuse. Lvs. linear. Hds. corymbed. *W. E. DIVARICATUM*.
 4 Leaves nearly entire. Rays 50—80, bluish-purple.....*E. BELLIDIFOLIUM*.
 4 Leaves nearly entire. Rays 150—200, reddish-purple...*E. PHILADELPHICUM*.
 4 Lvs. sinuate-pinnatifid-toothed. Rays 100—200, light purp. *S. E. QUERCIFOLIUM*.

- 5 Stem leafy, 3—5f high. Leaves coarsely-toothed. E. HETEROPHYLLUM.
 5 Stem leafy, 2—3f high. Lvs. nearly entire and smooth. E. STRIGOSUM.
 5 Stem leafless, 1—2f high. Heads few; rays about 30. S. E. VERNUM.

7. ACHILLEA. YARROW. MILLFOIL.

Heads many-flowered, rays few, fertile; receptacle flat, chaffy; achenia flattened, margined, without a pappus.—4 European herbs with small, 4—12-rayed heads in corymbs. *June—Sept.*

Leaves twice pinnatifid with fine segments. Rays 4 or 5. c. A. MILLEFOLIUM.
 Leaves undivided, lance-linear, serrate. Rays 8—12. r. A. PTÁRMICA.

8. TARAXACUM. DANDELION.

Involucre many-flowered, double, the outer of small scales, much shorter than the close, erect row of the inner. Receptacle naked. Achenia produced into a long beak crowned with copious, white, hair-like bristles of the pappus.—Acaulescent herbs with runcinate leaves.

T. DENS-LEONIS. Outer scales of the involucre reflexed. Leaves runcinate, smooth, dentate.—In all open situations, blossoming at all seasons except winter. Scape round, hollow, lengthening after flowering, and bearing a globular head of seeds and seed-down, whose light and airy form is a very familiar sight to all.

9. HIERACIUM. HAWK-WEED.

Involucre more or less imbricated, egg-shaped, many-flowered. Achenia not prolonged into a beak, striate. Pappus of rough, brittle, numerous tawny bristles in a single row.—4 Leaves alternate, entire or toothed. Florets yellow. *July—Sept.*

1 Involucre and stalks smooth or nearly so 2

1 Involucre, stalks, &c. rough with glandular hairs 3

2 St. leafy, corym. at top. Lvs. sharp-toothed. Hds. 50—60-fl'wd. N. H. CANADENSE.

2 St. leafy, widely panicled. Lvs. fine-toothed. Hds. 10—20-fl'wd. H. PANICULATUM.

2 St. almost leafless, corymbd. Lvs. entire. Hds. 15—20-flowered. H. VENOSUM.

3 Hds. 40—50-flowered, corymbd. Plant stiff, rough-hairy. ... H. SCABRUM.

3 Hds. 20—30-fl'wd. Pl. clothed with straight bristles 1' long. W. H. LONGIPILUM.

3 Hds. 20—30-flowered. Plant slender, quite hairy below H. GRONOVII.

10. NAB'ALUS. LION'S-FOOT.

Involucre cylindrical, double, the inner of many linear scales in one row, the outer of a few short scales at base. Receptacle naked. Achenia smooth, striate, not beaked, crowned with a copious, straw-colored or brownish hair-like pappus.—Erect herbs, with a thick, tuberous, bitter root. Heads 5—18-flowered, white or straw-colored, often purplish. *Aug.—Oct.*

- 1 Heads glabrous, pendulous. Leaves multiform in the same plant....2
- 1 Heads hairy, erect or nodding. Leaves reniform, undivided....6
- 2 Tall (2—4f high); heads (8—12-flowered) in a corymb-like panicle....3
- 2 Tall (2—6f high); heads in a long, raceme-like panicle....4
- 2 Low (5'—10' high); heads racemed. Found only on high mountains....5
- 3 Pappus cinnamon-color. Lvs. chiefly hastate, often lobed.....N. ALBA.
- 3 Pappus straw-color. Leaves chiefly deltoid, often cleft.....N. FRASÉRI.
- 4 Hds. 5-flow'd. Lvs. divided or cleft or entire. Pap. dull-white. N. ALTÍSSIMUS.
- 4 Hds. 8—12-flowered. Lowest lvs. pinnatifid. Pap. straw-color. N. VIRGATUS.
- 5 Outer involucre of short-ovate, close scales. Lvs. deltoid, &c...N. NANUS.
- 5 Outer invol. of linear, loose scales. Lvs. cordate-hastate, &c...N. BOÛTII.
- 6 Heads nodding, 9—12-flowered. Panicle spike-form. W. M. N. RACEMOSUS.
- 6 Heads nodding, 25—35-flowered. Panicle corymbed. W. S. N. CREPIDÍNEUS.
- 6 Heads erect, 11—14-flowered. Panicle racemed. W.....N. ÁSPER.

ORDER 76. LOBELIACEÆ.—LOBELIADS.

Herbs with alternate leaves, scattered flowers and often milky juice.

Calyx superior, *corolla* irregular, 5-lobed, tube split down to the base.

Stamens 5, united into a tube both by the filaments and anthers.

Ovary adherent to the calyx tube, *styles* united into one.

Stigma fringed. *Fruit* a 2—3-celled, many-seeded capsule.

LOBELIA. CARDINAL-FLOWER. INDIAN TOBACCO.

The two upper lobes of the irregular corolla are smaller than the three lower. Stamens united into a curved tube. Stigma 2-lobed. Capsule opening at top. Seeds very small.—Flowers axillary, generally forming leafy or bracted racemes. *July—Sept.*

1 Stems leafy....2

1 Stems leafless, leaves nearly all crowded at the root, under water....9

2 Flowers bright red or scarlet, large and showy....5

2 Flowers blue, varying to bluish-white....3

- 3 Stem stout, 2—3 or 4f high. Flowers large, about 1' long....6
 3 Stem slender, 6'—2f high. Flowers small ($\frac{1}{4}$ — $\frac{1}{2}$ ' long)....4
 4 Stem branched, racemes several, loose, or flowers scattered....7
 4 Stem generally simple, bearing a single raceme....8
 5 Stem smooth. Lvs. oblong-lanceolate, acute at each end...L. CARDINALIS.
 5 Stem downy. Leaves linear-lanceolate, long-pointed.† S....L. PULGENS.
 6 Leaves obtuse, denticulate. Raceme one-sided. Plant downy...L. PUBERULA.
 6 Leaves acute, slightly toothed. Raceme equal. Plant hairy. L. SYPHILITICA.
 6 Lvs. acuminate, toothed., Rac. one-sided. Plant smoothish. S...L. AMGENA.
 7 Hairy. Leaves ovate-lanceolate, toothed. Pod inflated.....L. INFLATA.
 7 Smooth. Lvs. roundish-ovate, crenate-dentate, petiolate...L. MICHAELII.
 7 Smooth. Lvs. linear-spatulate, entire. Flowers blue-white....L. KÄLMII.
 8 Pedi. twice as long as fls. Lvs. linear. Pl. extremely slend.S.M. L. NUTTALLII.
 8 Pedicels as long as the fls. Racemes dense. Leaves oblong....L. SPICATA.
 8 Pedi. none. Spike rather dense. Lvs. lance-oval, smooth. W. L. LEPTOSTACHYA.
 8 Pedi. very short. Fls. few. Lvs. linear-lanceolate, thickish. S. L. GLANDULOSA.
 9 Rt. lvs. linear, terete, hollow, fleshy, 2'—3' long. Scape long. L. DORTMANNA.
 9 Root lvs. linear-oblong, flat, 4'—6' long. Stem tall. S.....L. PALUDOSA.

ORDER 77. CAMPANULACEÆ.—BELLWORTS.

Herbs with a milky juice, alternate *leaves*, *flowers* mostly blue and showy, with a superior *calyx*, a regular and mostly campanulate, 5-lobed *corolla* with the 5 *stamens* usually separate, and *ovary* adherent to the calyx tube, and with the 2—5-celled *pod* crowned with the remains of the calyx.

ANALYSIS OF THE GENERA.

- Calyx tube very short (below the flower).....CAMPANULA. 1
 Calyx tube long and three-angled.....SPECULARIA.

1. CAMPANULA. BELL-FLOWER. HAREBELL.

Calyx 5-cleft. Corolla bell-shaped, funnel-shaped or wheel-shaped, its 5 lobes valvate in the bud, closed at the base inside by the valve-like bases of the 5 stamens. Pod opening on the sides.—4 *Herbs* with axillary or terminal flowers. *June—Oct.*

- 1 Corolla wheel-shaped, flat, in leafy spikes....4
 1 Corolla bell-shaped, &c., broadly or narrowly....2
 2 Flowers on slender pedicels, solitary or panicked....3
 2 Flowers sessile or nearly so. Stem erect. Gardens....7
 3 Flowers large (6"—12" broad). Root lvs. unlike the stem lvs....5
 3 Flowers small (2"—5" broad). Leaves all similar in form....6

- 4 Stem tall (3—5f), branches spreading. Upper lvs. hairy. *W. C. ILLINOÏENSIS*.
 4 Stem tall (2—4f), simple. Lvs. pointed at ends, smooth. *M. W. C. AMERICANA*.
 4 St. low (7—12'), simp. Lvs. thick, shining, obtuse or acute.† *C. PLANIFLORA*.
 5 St. weak, inclining. Rt. lvs. roundish, stem lvs. linear. *N. C. ROTUNDIFOLIA*.
 5 St. erect. Lvs. obovate and lance-linear. Fls. very broad.† *C. PERSICIFOLIA*.
 6 Stem reclining, rough backwards. Lvs. narrow. Fls. white. *C. APARINOIDES*.
 6 Stem erect. Panicle wide. Lvs. lanceo., toothed. Fls. blue. *S. C. DIVARICATA*.
 7 Flowers crowded above, funnel-shaped. Plant smooth.†... *C. GLOMERATA*.
 7 Flowers distant, very large, obtuse at base. Plant bristly.†... *C. MEDIUM*.
 7 Fls. scattered, rather large, acute at base. Plant woolly.†... *C. LANUGINOSA*.



Fig. 235. *a*, *Campanula rotundifolia*, whole plant. *e*, Ovary of *Campanula Medium* (Canterbury Bells), with *f*, a broad filament, *s*, an anther, and *p*, the hairy style. *b*, A cross section of the curious 5-celled seed vessel, 2 placenta in each cell; *d*, seed cut open, showing the large embryo.

ORDER 78. ERICACEÆ.—HEATHWORTS.

Herbs or more generally *shrubs* with simple, often evergreen leaves, *flowers* regular or nearly so, 4 or 5-parted, *petals* rarely almost distinct, *stamens* as many or twice as many as the lobes of the corolla, and the *anthers* oddly appendaged and generally opening by two terminal pores, the *style* 1 and the *ovary* 4—10-celled, with albuminous seeds.

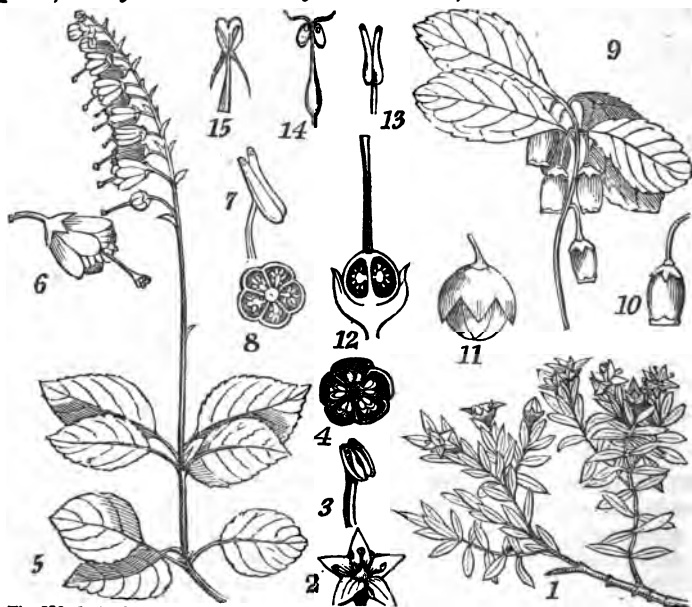


Fig. 236. 1, *Azalea procumbens*. 2, A flower enlarged. 3, A stamen, much enlarged, showing the lengthwise opening of each of the cells. 4, Cross section of a 5-celled capsule of *Rhododendron*, showing the inflexed margins of the valves. 5, *Pyrola secunda*. 6, A flower enlarged. 7, A stamen enlarged, showing the terminal tubes and pores. 8, Cross-section of a 5-celled, many-seeded capsule. 9, *Gaultheria* (Checkerberry). 10, A flower enlarged. 11, A berry. 12, Vertical section of the ovary, showing the free, fleshy calyx. 13, Anther of *Vaccinium* *Vitis* dea. 14, Stamen of *Arctostaphylos* (Bear-berry). 15, Awned stamen of a *Vaccinium* (Blueberry).

ANALYSIS OF THE GENERA.

- 1 Shrubs with green leaves, erect or prostrate....2
- 1 Herbs, with green and mostly radical leaves....18
- 1 Herbs, destitute of green leaves or of any green color....19
 - 2 Ovary free from the calyx (superior)....3
 - 2 Ovary adherent to the calyx tube (inferior)....9
- 3 Petals united into a monopetalous corolla....4
- 3 Petals entirely or very nearly separate and distinct....8
 - 4 Flowers 4-parted, with 8 stamens....10
 - 4 Flowers 5-parted, with 5—10 stamens....5
- 5 Corolla small, urn-shaped, &c., the limb small and narrow....6
- 5 Corolla small or large, the limb widely spreading....7
 - 6 Fruit fleshy, a drupe or berry....11
 - 6 Fruit a dry pod (capsule)....12
- 7 Corolla limb entire, saucer-form....14
- 7 Corolla limb 5-cleft or lobed, funnel or bell-form....13
 - 8 Pods 3-celled, cells many-seeded....15
 - 8 Pods 5 or 7-celled, cells many-seeded....16
 - 8 Pods 2 or 3-celled, cells only one-seeded....17

(SUB-ORDER 1. VACCINEÆ. BLUEBERRIES, &c.)

- 9 Erect shrubs. Cor. urn-shaped, &c. Limb narrow. *Blueberry*. &c. VACCINIUM.
- 9 Trailing or erect. Cor. deeply 4-cleft, lobes reflexed. *Cranberry*. OXYCOCUS. 1
- 9 Trailing shrubs. Cor. deeply 4-cleft, lobes spreading. *Boxberry*. CHIOGENES.

(SUB-ORDER 2. ERICINEÆ. TRUE HEATHWORTS.)

- 10 Leaves linear-aciculate, whorled or crowded. *Cult. Heath*.....ERICA.
- 10 Leaves oval-lanceolate. A shrub 4f high. *S*....MENZIESIA *globularis*.
- 11 A very small shrub (almost herbac.). Berry many-seeded...GAULTHERIA.
- 11 Shrubs trailing or tufted. Drupe 5-seeded. *Bearberry*...ARCTOSTAPHYLOS.
- 12 Pod opening between cells. Lvs. linear, heath-like. MENZIESIA *taxifolia*.
- 12 Pod open. into cells. Lvs. broad (in *A. hypnoides* moss-like). ANDROMEDA.
- 13 Stam. included. Plant trailing, with large oval lvs. *May-flower*...EPIGEA.
- 13 Stamens included. Plant and lvs. very small. Fls. rose-red....AZALEA.
- 13 Stam. long, projecting from large, slightly irreg. corolla. RHODODENDRON. 2
- 14 Anthers held in 10 pits of the corolla. *Calico-bush*, &c.....KALMIA. 3

- 15 Leaves alternate, deciduous, serrate. Fls. racemed... *CLËTHRA alnisfolia*.
 15 Lvs. mostly oppos., evergr., ent. Fls. umbel'd. *Sand Myrtle*. *LEIOPHYLLUM*.
 16 Flowers 5-parted. Corolla regular. *Labrador Tea*..... *LËDUM*.
 16 Flowers 5-parted. Corolla irregular..... *RHODORA Canadënsis*.
 16 Flowers 7-parted, regular. Stamens 14. *S*..... *BEFARIA racemösa*.

(SUB-ORDER 3. CYRILLEÆ. CYRILLADS.)

- 17 Fls. 4-parted, with 8 stamens and a 2-seeded pod. *S*.. *ELLIÖTTIA racemösa*.
 17 Fls. 4-parted, with 5 stamens. Lvs. lanceo. entire. *S*. *CYRÏLLA racemiflora*.
 17 Fls. 5-p'ted, with 10 sta. Lvs. lanceo., entire. *S*. *MYLOCÄRYUM ligustrinum*.

(SUB-ORDER 4. PYROLEÆ. PYROLAS.)

- 18 Flowers racemed, many. Perennial, low, smooth, erect..... *PÝROLA*. 4
 18 Flower solitary, one only. Perenn. small. *N*. *r*..... *MONËSES uniflora*.
 18 Fls. corymb'd, few. Lvs. evergreen, thick.... *Pipsissewa*.. *CHIMÁPHILA*.

(SUB-ORDER 5. MONOTROPEÆ. INDIAN PIPES.)

- 19 Flower solitary, petals separate. Plant white.. *Indian Pipe*. *MONÖTROPÄ*.
 19 Fls. crowded in hds., reddish-white. *S*.. *Carolina Beechdrops*. *MONOTRÖPSIS*.
 19 Flowers in a short raceme. Plant tawny..... *Pine-sap*.... *HYPÖPITYS*.
 19 Fls. in a long raceme. Petals united. Plant brown, lf. *N*.. *PTERÖSPORA*.

1. OXYCOC'CUS. CRANBERRY.

Calyx superior, 4-cleft. Corolla 4-parted, with lance-linear, reflexed segments. Stamens 8, anthers tubular, 2-parted, opening by oblique pores. Berry globular, 4-celled, many-seeded.—Trailing and very slender, with woody stems, alternate, thick, narrow, entire leaves, and acid, eatable fruit. Flowers purplish. *June*.

Trailing. Lvs. ovate, 2"—4" long. Pedicels terminal, 1-flowered. *O*. *PÄLÜSTRIS*.
 Trailing. Lvs. oblong, 4"—6" long. Pedics. axillary, 1-flw'd. *O*. *MACROCÄRPUS*.
 Erect. Lvs. oval, pointed, serru. Pets. not reflexed at first. *S*. *O*. *ERYTHOCÄRPUS*.

2. RHODODENDRON. ROSE-BAY. SWAMP PINK.

Calyx 5-parted, small. Corolla funnel or bell-form, generally a little irregular, 5-lobed. Stamens 5—10, mostly projecting and declined, anthers opening by two terminal pores. Pods 5-celled,

5-valved.—Shrubs with alternate, entire leaves. Flowers mostly in corymbed, terminal clusters, variously shaded with blue, red or white.

- 1 Leaves evergreen, leathery. Cor. mostly bell-form. Stamens 10....3
- 1 Lvs. deciduous. Cor. funnel-form. Stam. 5, sometimes 6 or more....2
- 2 Flowers leafy, appearing after the leaves have grown....4
- 2 Flowers expanding before the lvs. or at the same time with them....5
- 3 Leaves large, acute or acuminate, smooth....6
- 3 Leaves small, oval, obtuse at each end....7
- 4 Smooth. Sep. long, conspic. Cor. large, rose-colored, 3-10f. *R. ARBORÆSCENS.*
- 4 Bristly-hairy. Sep. minute. Cor. clammy-hairy, whitish, 4-10f. *R. VISCOSUM.*
- 5 Sepals minute. Cor. tube longer than the lobes, flesh-purple. *R. NUDIFLORUM.*
- 5 Sep. 3"—4" long. Cor. tube shorter than lobes, orange-red. *R. CALENDULACEUM.*
- 5 Sep. short, one of them 4 times longest. Cor. small, red-white. *S. R. BFCOLOR.*
- 6 Lvs. discolored beneath, 4'—9' long. Corymbs very large, spotted. *R. MÁXIMUM.*
- 6 Lvs. resin-dotted beneath. Fls. small, funnel-form. Pods long. *R. PUNCTATUM.*
- 6 Lvs. green both sides, pointed. Fls. large, few, wheel-bell-form. *R. PÓNTICUM.*
- 7 Shrub 3—4f high. Fls. rose-colored, bell-form, corymbed. *R. CATAWBIENSE.*
- 7 Shrub 4'—8' high, in tufts. Fls. solitary, blue-purple. *Mis. R. LAPÓNICUM.*

3. KAL'MIA. CALICO-BUSH. MOUNTAIN LAUREL.

Calyx 5-parted. Corolla with 10 prominences beneath and 10 corresponding pits within, holding the 10 anthers. Filaments recurved. Border with 5 shallow lobes. Capsule 5-celled, many-seeded.—Beautiful shrubs, with entire, evergreen, leathery leaves. Flowers white and red, in racemed corymbs. *May—June.*

- 1 Flowers in terminal corymbs. Leaves smooth, thick....2
- 1 Flowers in lateral corymbs. Lvs. rusty or downy beneath....3
- 1 Flowers axillary, solitary, stalked, red. Plant hairy, 1—2f. *S. K. HIRSUTA.*
- 2 Lvs. scat'd, green both sides. Corym. large, rose-white. 3—20f. *K. LATIFÓLIA.*
- 2 Lvs. opposite, glaucous-white beneath. Corymbs sm. lilac. 2—3f. *K. GLAÜCA.*
- 3 Lvs. scattered, wedge-oblong. Corymbs small, roseate. 3—5f. *S. K. CUNEATA.*
- 3 Lvs. opposite and in 3s. Corymbs small, deep purp. 3—4f. *K. ANGUSTIFÓLIA.*

4. PYROLA. FALSE WINTER-GREEN.

Calyx 5-parted. Petals 5, equal. Stamens 10, anthers large, turned outwards, opening by 2 pores at the obtuse top. Style thick, long, stigmas 5, often projecting like rays. Pod 5-celled, 5-valved, opening into the cells, many-seeded.—4 Low, evergreen herbs.

almost woody, with the leaves generally radical, and the scape bearing a raceme of nodding flowers. Mostly northern. *June, July.*

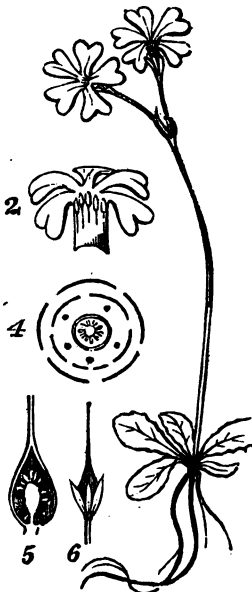
- 1 Stamens ascending, style declined and curved....2
- 1 Stamens and style straight and erect....5
- 2 Leaves thick and shining. Flowers white or rose-colored....3
- 2 Leaves green, not shining. Flowers greenish-white....4
- 3 Lvs. orbicular. Sepals $\frac{1}{2}$ as long as mostly white petals. *P. ROTUNDIFOLIA.*
- 3 Lvs. round-cordate. Sep. $\frac{1}{2}$ as long as the rose-colored petals. *P. ASARIFOLIA.*
- 3 Lvs. roundish. Sepals $\frac{1}{2}$ as long as the red-purple petals....*P. ULIGINOSA.*
- 4 Lvs. large, thin, elliptical, light green, on short petioles.....*P. ELLIPTICA.*
- 4 Lvs. small, thick, roundish, twice shorter than the petioles...*P. CHLORANTHA.*
- 4 Lvs. none, or scarcely any. (A variety of *P. chlorantha*?) *N.E. P. APHYLLA.*
- 5 Raceme with the greenish-white flowers all on one side.....*P. SECUNDA.*
- 5 Raceme spike-form, with small, globular, white flowers. *Mts.*....*P. MINOR.*

ORDER 82. PRIMULACEÆ.

PRIMWORTS.

Herbs low, with the *leaves* either radical or mostly opposite, with the *flowers* 5- (rarely 4 or 6) parted, the *corolla* monopetalous, regular, the *stamens* inserted on the corolla tube and opposite to its lobes, the *ovary* 1-celled with a free, central placenta, *style* 1, *stigma* 1, the *capsule* 1-celled, many-seeded, *seeds* with fleshy albumen.

Fig. 237. *Primula Mistassinica*, the whole plant. 2, The corolla cut open, showing the stamens on the tube. 4, The plan of the flower, showing the stamens opposite the petals. 6, The calyx and ovary. 5, The fruit cut open, showing the seeds on the free central placenta.



ANALYSIS OF THE GENERA.

- 1 Stemless. Leaves all radical, scape bearing an umbel....3
- 1 Stems leafy. Flowers yellow, corolla wheel-form (tube none)....4
- 1 Stems leafy. Flowers white, red, &c., never yellow....2
- 2 Leaves whorled, at least those near the flowers. Corolla white....5
- 2 Leaves opposite, entire. Flowers axillary, solitary....6
- 2 Leaves alternate, entire. Flowers white....7
- 3 Corolla tube egg-shaped, lobes short, spread. *Dwarf Primrose*. ANDROSACE.
- 3 Corolla tube cylindrical, lobes spreading. *Primrose*.....PRIMULA. 1
- 3 Corolla tube cylindrical, lobes reflexed. *American Cowslip*. DODECÁTHEON. 2
- 4 Cor. 5-parted, without intermediate teeth. Fls. axill. or rac.. LYSIMÁCHIA. 3
- 4 Cor. 6-parted, with 6 intermediate teeth. Rac. axill. *NAUMBERGIA thyrsiflora*.
- 5 Fls. 7-part. Lvs. entire, in a single whorl. *Chick Wintergreen*. TRIENTALIS.
- 5 Fls. 5-part. Lvs. finely pinnat., in water. *Feather-foil*. HOTTÓNIA inflata.
- 6 Plant prostrate, with scarlet corollas. *Pimpernel*.....ANAGÁLLIS arvensis.
- 6 Plant erect, with no corolla, but white calyxes. *Black Saltwort*....GLAUX.
- 7 Fls. 5-parted, paniced. Plant 8'—15' high. *Water Pimpernel*...SÁMOLUS.
- 7 Fls. 4-parted, axillary. Plant 1'—2' high. *Dwarf Pimpernel*. CENTÚNCULUS

1. PRIMULA. PRIMROSE. AURICULA.

Calyx angular, 5-cleft. Corolla salver-shaped, or often rather funnel-shaped, with 5 entire or notched or bifid lobes. Stamens 5, included. Pod opening at the top, many-seeded.—4 Herbs with the leaves all radical, and the flowers showy, in an umbel on a scape.

- 1 Corolla salver-form, limb abruptly spreading. Plants wild, rare....3
- 1 Corolla salver-form, limb abruptly spreading. Plants cultivated....4
- 1 Corolla funnel-form, limb gradually spreading. Cultivated....2
- 2 Leaves hairy, rugose, toothed or crenate or wavy at edge....5
- 2 Leaves smooth, plane, entire, or sometimes crenate....6
- 3 Plant smooth, green, 3'—8' high. Fls. 1—8, flesh-col'd. *N. P. MISTASSINICA*.
- 3 Pl. covered with meal, 3'—10' high. Fls. 3—20, lilac-yellow. *N. P. FARINOSA*.
- 4 Petals obcordate, notched, yellow, varying to purple, &c.†...*P. GRANDIFLORA*.
- 4 Petals obtuse, entire, dark-violet, never yellow.†.....*P. PURPUREA*.
- 5 Lvs. hairy both sides. Outer fls. nodding, border concave.† *P. OFFICINALIS*.
- 5 Lvs. smooth above. All the fls. nodding, border flat.†.....*P. ELÁTIOR*.
- 6 Leaves and calyx mealy-glaucous. Bracts very short.†.....*P. AURÍCULA*.
- 6 Lvs. white-edged. calyx inflated. Bracts long. Fls. purple.†...*P. CALYCINA*.

2. DODECATHEON.

AMERICAN COWSLIP.

Calyx 5-parted, reflexed. Corolla tube very short, limb rotate, 5-parted, with the limb reflexed. Stamens 5, inserted into the throat of the corolla, filaments short, anthers long, acute connivent at apex, but shorter than the style.—4 Leaves all radical, oblong, scape erect, bearing an umbel of nodding rose or white flowers. *May, June.*

Fig. 238. *Dodecatheon Meadia*, whole plant. *b*, A single flower, natural size. *c*, Fruit (pyxis) of *Anagallis*, with its lid open, showing the seeds.



Filaments much shorter than the anthers. Scape 1—2f. *W.*†.....*D. MEÁDIA*.
Filaments about as long as the anthers. Scape 6'—10'. *W.*...*D. INTEGRIFÓLIA*.

3. LYSIMACHIA. LOOSE-STRIPE.

Calyx 5-parted. Corolla tube very short, limb 5-parted, spreading. Stamens 5, on the base of the corolla, filaments often united. Pods 5—10-valved. Seeds several or many.—4 Leaves opposite or whorled, entire. Flowers mostly yellow. *June, July.*

- 1 Erect. Peduncles several-flowered, or flowers panicled....2
- 1 Erect. Pedicels one-flowered, flowers racemed....7
- 1 Erect. Pedicels one-flowered, flowers axillary....3
- 1 Prostrate, creeping. Pedicels (or umbels) axillary....8

- 2 Leaves thick, rather obtuse, with the edges rolled back....5
 2 Leaves thin, acuminate, with the edges not rolled....6
 3 Leaves mostly opposite, on petioles fringed with hairs....4
 3 Leaves whorled in 3s, 4s and 5s, sessile. Stem simple...L. QUADRIFOLIA.
 4 Leaves ovate, often cordate. Stems mostly branched.....L. CILIATA.
 4 Leaves lance-oblong, the upper whorled. Stems branched.....L. HIBRIDA.
 4 Leaves linear-lanceolate, all opposite, the lower obtuse. W. L. HETEROPHYLLA.
 5 Leaves oblong-lanceolate. Panicle bracted, terminal. S. L. ASPERIFOLIA.
 5 Lvs. lance-linear. Flowers large, scarcely paniced. W. L. LONGIFOLIA.
 6 Lvs. whorled in 4s, lanceolate. Upper flowers racemed. S. L. LANCEOLATA.
 6 Lvs. opposite, ovate, often cordate. Panicle large. S.....L. FRASERI.
 7 Leaves nearly opposite, narrow-lanceolate, with bulblets.....L. STRICTA.
 7 Lvs. whorled, in 4s or 5s, lanceolate, acuminate. S.....L. HERBEMONTI.
 8 Branches rooting at the end. Leaves lanceolate, acuminate...L. RADICANS.
 8 Stem simple. Leaves roundish, very obtuse, opposite. Vt. L. NUMMULARIA.

ORDER 91. SCROPHULARIACEÆ.—FIGWORTS.

Mostly *herbs* without fragrance, and irregular, unsymmetrical *flowers*.

Calyx mostly 5 parted, free from the ovary, persistent.

Corolla bilabiate, personate or otherwise irregular, lobes imbricated in the bud. *Stamens* 4, didynamous, often but 2; often with a 5th filament, rarely a 5th stamen. *Ovary* free, 2-celled, *style* 1, *stigma* 2-lobed, becoming in *fruit* a 2-celled, many-seeded capsule, with the *placentæ* in the middle. *Seeds* with abundant albumen.

ANALYSIS OF THE GENERA.

- 1 Herbs with the leaves alternate or all radical....2
 1 Herbs with the leaves opposite, and sometimes whorled....8
 1 Trees with large, cordate lvs. and panicles of scarlet fls.†...PAULOWNIA.
 2 Flowers (diandrous) with only 2 perfect stamens....3
 2 Flowers (didynamous) with 4 stamens mostly of unequal length....4
 2 Fls. (pentandrous) with 5 perfect stam. Cor. rotate. *Mullein*...VERBASCUM. 1
 3 Cor. 4-lobed, minute, white. Plant small. Lvs. radical. S. AMPHIANTHUS.
 3 Cor. 4-lobed. Fls. spiked. Lvs. mostly radicle. Scape lf. N-W. SYNTHIRIS.
 3 Cor. deeply many-cleft, variously colored. Lvs. pinnat.† SCHIZANTHUS.

- 4 Corolla labiate, with the throat closed (personate)....5
 4 Corolla labiate, throat open, upper lip arched....6
 4 Corolla rather bell-shaped, with 5 nearly equal lobes....7
 5 Cor. protracted into a spur behind. Racemes leafy. *Toad-flax*.. LINÀRIA. 2
 5 Cor. swollen into a sack behind. Rac. leafy.† *Snap-dragon*. ANTIRRHINUM.
 6 Bracts lobed, generally col'd. Anth.-cells unequal. *Painted-cup*. CASTILLEJA.
 6 Bracts and leaves entire, green. Flowers purplish. *Chaff-seed*. SCHWÁLBEA.
 6 Bracts and leaves serrate, green. Flowers yellow. *Lousewort*. PEDICULARIS.
 7 Tall, erect, with large, nodding flowers. Gardens. *Foxglove*. DIGITALIS.
 7 Low and minute. Cor. equally 5-cleft. In mud. *Mudwort*. LIMOSÉLLA.
 8 Flowers with only 2 perfect stamens (diandrous)....9
 8 Flowers with 4 perfect stamens, the 5th scarcely appearing....10
 8 Flowers with 4 perfect stamens, and a 5th sterile distinct filament....14
 9 Corolla labiate. Cal. 5-parted. Sterile filaments minute or 0.. GRATIOLA. 3
 9 Cor. labiate. Cal. 5-parted. Sterile filam. forked. *Mud-flower*. ILYSANTHUS.
 9 Cor. labiate. Calyx 4-parted. Fls. very small. *Semi-flower*. HEMIANTHUS.
 9 Cor. rotate, with 4 nearly equal lobes, lower smallest. *Speedwell*. VERÓNICA. 4
 10 Corolla labiate (2-lipped) the limb quite irregular....11
 10 Corolla limb nearly regular, of 4 or 5 plane, spreading lobes....15
 11 Stamens included in the tube of the corolla, generally in pairs....12
 11 Stamens ascending beneath the erect, arched upper lip....13
 11 Sta. descending into the sack-shaped lower lip. *Tall-pink*.. COLLÍNSIA.
 12 Lvs. serr. Sts. square. Palate of lower lip prominent. *Monkey-fl.* MIMULUS. 5
 12 Leaves many-cleft into fine divisions. W..... CONOBÆA *Multifida*.
 12 Leaves entire. Corolla protracted into a spur behind. *Toad-flax*. LINÀRIA. 2
 12 Lvs. entire. Cor. not spurred. Small, obscure weeds. W.M.S. HERPÉSTIS.
 13 Fls. yellow, in a terminal, one-sided spike. *Yellow-rattle*.. RHINANTHUS.
 13 Fls. white, small, in a term. one-sided spike. *Mis. Eye-bright*. EUPHRASIA.
 13 Fls. yellowish, axil., or in a leafy equal spike. *Cow-wheat*. MELAMPYRUM.
 14 Ster. filam. shorter than the rest, sm'th. Sds. winged. *Snake-head*. CHELONE. 6
 14 Ster. filam. long, project., bearded. Sds. wingd. *Beard-tongue*. PENTSTEMON.
 15 Cor. white, rota., 4-part'd. Lvs. subulate-lin. S. POLYPRÆMUM *procumbens*.
 15 Cor. purp., in a long, slindr. spike. Lvs. lance-ovat. *Blue-hearts*. BUCHNERA.
 15 Cor. purp. or rose-white, axillary. Lvs. narrow-lin., entire. GERÁRDIA. 7
 15 Corolla yellow, and 5-lobed as well as the calyx....16

16 Stamens scarcely longer than the tube of the corolla....17

16 Stamens long-projecting, with very large anthers. *S*.....MACRANTHERA.

17 Stam. quite unequal, anthers all perfect. Sepals very short. *DASYSTOMA*. 8

17 Stam. unequ., upper pair with empty anths. Sep. leafy. *M. W.* OTOPHYLLA.

17 Stam. about equal in length, anths. all perfect. Sep. long. *W.* SEYMERIA.

1. VERBAS' CUM. MULLEIN.

Calyx 5-parted. Corolla rotate, 5-lobed, slightly irregular. Stamens 5, all perfect, filaments woolly, at least the three upper ones. Pod roundish-egg shaped, 2-valved, many-seeded.—Mostly ① herba. Flowers in spikes, or panicles, or racemes. Lvs. alternate. *Jun—Aug.*

Tall, woolly. Lvs. decurrent. Fls. spiked, 2 filaments smooth. *c. V.* THAPSUS. Branched, smooth. Lvs. serrate. Fls. racem. Fil. violet-woolly. *r. V.* BLATTARIA. Whit.-downy, branched. Lvs. crenate. Fls. panic. Fil. white-woolly. *r. V.* LYCHNITIS.

2. LINARIA. TOAD-FLAX.

Calyx 5-parted. Corolla personate with the throat closed by the prominent palate, upper lip reflexed, lower 3-cleft, tube inflated and spurred behind. Pod 2-celled, bursting below the top.—Herbs with the lower leaves generally opposite, the upper alternate. Flowers solitary, axillary, often forming leafy racemes. *June—Sept.*

1 Species found only in cultivation, in gardens....3

1 Species growing wild in fields and road-sides....2

2 Lvs. lance-linear. Fls. large, yellow, in a close raceme. Erect. *L.* VULGARIS.

2 Lvs. lin., obtuse. Fls. small, blue, loosely racem. St. erect. *L.* CANADENSE.

2 Lvs. ovate-hastate. Fls. small, yel'w. and purp. Stem prostrate. *L.* ELÂTINE.

3 Lvs. whorled, lanceo., acute. Fls. pale-violet-yel'w. *L.* TRIORNITHOPHORUM.

3 Lvs. alternate above, lin'r. Fls. violet-blue, upper lip 2-divid. *L.* BIPARTITA.

3. GRATIOLA. HEDGE-HYSSOP.

Calyx nearly equally 5-parted. Corolla upper lip entire or slightly 2-cleft, lower 3-cleft. Fertile stamens 2, mostly with 3 sterile filaments. Pod 2-celled, 4-valved, many-seeded.—Low herbs with opposite leaves. Peduncles axillary, 1-flowered, usually with 2 bracts near the calyx. *June—Aug.*

1 Flowers on peduncles. Plants weak, smooth or viscid....2

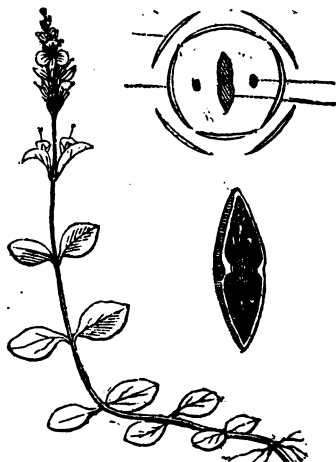
1 Flowers sessile or nearly so. Plants rigid, bristly-hairy. *S*....7

- 2 Sterile filaments thread-like, tipped with a small head....3
 2 Sterile filaments none, or very minute and pointed....6
 3 Leaves entire or nearly so. Plants smooth....4
 3 Leaves toothed. Plants generally viscid-downy. Flowers white....5
 4 Stem erect. Lvs. lanceolate, clasping. Flowers whitish. *S. G. OFFICINÀLIS.*
 4 Stem ascending, branched. Leaves sessile. Fls. yellow, showy....*G. ÀUREA.*
 5 Leaves ovate-lanceolate. Sepals and bracts lanceolate. *S. G. VISCOSA.*
 5 Leaves lanceolate. Sepals and bracts awl-shaped. *S. G. DRUMMÓNDII.*
 5 Leaves linear-lanceolate. Bracts minute. Sepals linear. *S. G. RAMÓSA.*
 6 Peduncles not longer than calyx. Pod globular, obtuse. *W. G. SPHÆROCÁRPA.*
 6 Ped. long, slender. Cor. thrice longer than cal. Stem erect. *S. G. FLORIDÀNA.*
 6 Ped. long, slend. Cor. twice longer than cal. Stem ascending. *G. VIRGINIÀNA.*
 7 Lvs. ovate, toothed. Corolla scarcely longer than calyx. *S. G. PILÓSA.*
 7 Lvs. narrow, entire. Corolla thrice longer than calyx *S. G. SUBULÀTA.*

4. VERONICA. SPEED-WELL.

Calyx 4-parted. Corolla with a wheel-shaped, spreading, 4-cleft border, the lower segment smallest. Stamens 2, inserted into the tube, projecting. Sterile filaments 0. Pod flattened, mostly obtuse or notched at the apex, 2-celled, few- or many-seeded.—Mostly herbs, with opposite leaves. Flowers small, solitary, axillary, or racemed, blue, flesh-color or white. *March—Sept.*

Fig. 240. *Veronica serpyllifolia*, whole plant. In the plan of the flower, *o*, is the 2-celled ovary; *s*, the 2 stamens; *p*, the 4 petals; *sp*, the 4 sepals; *a*, cross-section of the pod, showing its 2 cells, &c.



- 1 Erect, tall (14—4f). Flowers in dense terminal spikes....5
 1 Low, weak (3—12'). Leaves opposite. Corolla tube very short....9
 2 Racemes mostly opposite, from the axils of the leaves....6
 2 Racemes mostly alternate, from the axils of the leaves....7
 2 Racemes terminal, or the flowers axillary and not racemed....3

- 3 Floral leaves bract-like, longer than the erect peduncles.... 4
 3 Flo. lvs. like the rest, not longer than recurved pedunc. Plants hairy.... 10
 4 Plants almost glabrous. Pods roundish, with an obtuse notch.... 8
 4 Plants quite hairy. Pods obcordate, with a deep, acute notch.... 9
 5 Leaves whorled. Corolla tube longer than the limb.... V. VIRGINIANA.
 5 Leaves opposite. Corolla limb longer than the tube.†.... V. SPICATA.
 6 Lvs. sessile, cordate-clasping, ovate-lanceolate. Fls. sky-blue. V. ANAGALLIS.
 6 Lvs. petiol., oblong-ovate, base round. or corda. Fls. sky-blue. V. AMERICANA.
 7 Lvs. linear. Racemes very slender, loose, few-flowered.... V. SCUTELLATA.
 7 Lvs. obov.-elliptic., finely and sharply serrate. Rac. dense. V. OFFICINALIS.
 8 Lvs. near entire, round-oval. Cor. pale, with deep blue lines. V. SERPYLLIFOLIA.
 8 Lvs. toothed, oval-oblong, fleshy. Fls. nearly sessile, whitish. V. PERIGRINA.
 9 Lvs. ovate, crenate. Bracts narr. Fls. nearly sessile, sky-blue. V. ARVENSIS.
 9 Lvs. round-elliptical, entire or toothed. Fls. few, close, blue. Mts. V. ALPINA.
 10 Lvs. crenate-toothed. Sep. ovate-lanceolate. Ova. many-ovuled. V. AGRÆSTIS.
 10 Lvs. 3—5-toothed or lobed. Sep. triangular. Ova. 4-ovuled. V. HEDEREFOLIA.

5. MIMULUS. MONKEY-FLOWER.

Calyx prismatic, 5-angled and 5-toothed. Corolla tubular, upper lip reflexed or erect, 2-lobed, lower lip spreading, with a prominent palate, 3-lobed. Pod 2-celled, many-seeded.—Herbs prostrate or erect, with square stems, opposite lvs., and axillary solitary fls. *July*.

- 1 Species found only in cultivation, in gardens.... 3
 1 Species growing wild, in fields, road-sides, &c. Flowers blue.... 2
 2 Stem not all winged. Lvs. sessile. Peduncles longer than fl. c. M. RINGENS.
 2 Stem slightly winged. Lvs. petiolate. Peduncles shorter than cal. M. ALATUS.
 3 Flowers yellow, often spotted. Leaves round-ovate, stalked.†... M. LUTEA.
 3 Fls. scarlet, large and brilliant. Leaves ovate. Stem erect.† M. CARDINALIS.

6. CHELONE. SNAKE-HEAD.

Calyx deeply 5-parted, or the sepals distinct. Corolla inflated, upper lip broad, concave, lower 3-lobed, bearded in the throat. Stamens 4, woolly, with a 5th sterile filament shorter than the others. Seeds many, broadly wing-margined.—4 with opposite serrate leaves. *Aug.—Sept.*

Leaves lanceolate, petiolate. Fls. purple (A variety?). W. M... C. PURPUREA.
 Leaves lanceolate, sessile or nearly so. Fls. white or purplish.... C. GLABRA.
 Leaves ovate, petiolate, rarely cordate. Flowers purple or white. S... C. LIONI.

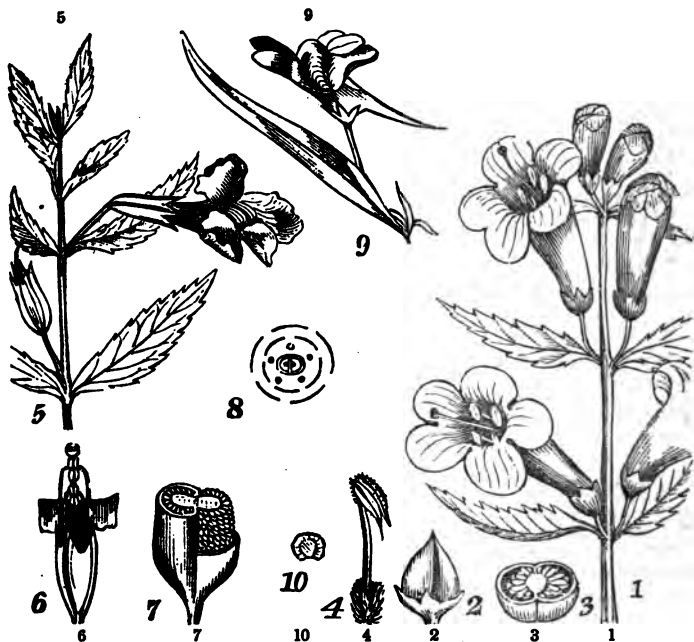


Fig. 239. 1, *Dasyostoma pubescens*. 2, Mature fruit. 3, Cross section of the 2-celled capsule. 4, A stamen enlarged. 5, *Mimulus ringens*. 6, Calyx with the corolla partly removed, showing the didynamous stamens in pairs, with the stigma above the highest pair. 7, Sections of the 2-celled, many-seeded capsule. 8, Plan of the flower, showing the position of the fifth rudimentary filament. 9, *Linaria vulgaris*, leaf and personate-bilabiate, spurred flower. 10, A winged seed.

7. GERARDIA. PURPLE GERARDIA.

Calyx bell-shaped, 5-toothed, valvate in the bud. Corolla tubular, swelling above, with 5 unequal spreading lobes, which are shorter than the tube. Stamens 4, quite unequal by pairs, included, hairy. Pod ovate, pointed, many-seeded.—① Erect and branching herbs, with opposite, slender leaves and large, showy purple or rose-colored flowers. *July—Sept.*

- 1 Corolla purple. Plants dark green, turning blackish in drying....2
- 1 Corolla rose-white. Plants light green, not blackening in drying....6
- 2 Peduncles very short, not exceeding the calyx....3
- 2 Peduncles longer than the calyx, but not exceeding the flower....4
- 2 Peduncles longer than the flower, and often than the leaves....5
- 3 Lvs. linear, acute, rough-edged. Fls. nearly sessile, 1' long..G. PURPUREA.
- 3 Lvs. linear, obtuse, fleshy. Fls. small, stalks long as cal. E. G. MARITIMA.
- 4 Stalks about twice longer than calyx. Sepals lanceolate. W....G. ASPERA.
- 4 Stalks about thrice longer than calyx. Sepals minute.....G. LINIFOLIA.
- 5 Leaves linear, as long as the peduncles. Flowers smooth. G. TENUIFOLIA.
- 5 Lvs. filiform, shorter than the peduncles. Flowers fringed..G. FILIFOLIA.
- 6 Lvs. and sepals bristle-shaped. Pod ovate, longer than calyx. S..G. SETACEA.
- 6 Lvs. none, white scales instead. Pod ovate, longer than cal. S..G. APHYLLA.
- 6 Lvs. linear ($\frac{1}{4}$ —1'), 1-veined. Pod round, as short as calyx. W. G. SKINNERIANA.

8. DASYSTOMA. YELLOW GERARDIA.

The characters are the same as in GERARDIA, except that the calyx is 5-cleft, and imbricated in the early bud, the corolla yellow, with tube longer than the lobes and woolly inside, the leaves rather large, and mostly pinnatifid, and the root 4. Flowers very showy. Plants 2—4f high. *July—Sept.*

- 1 Sepals finely toothed. Leaves all pinnatifid, with toothed lobes....4
- 1 Sepals entire. Leaves entire or mostly once pinnatifid-toothed....2
- 2 Glabrous. Leaves acute at apex, lanceolate in outline....3
- 2 Downy. Lvs. obtuse, entire except the lower. Sepals obtuse. D. PUBESCENS.
- 3 Glaucous. Lvs. mostly pinnatifid. Corolla 2' in length...D. QUERCIFOLIA.
- 3 Green. Lvs. entire. Stalks shorter than cal. Fls. 1' long..D. INTEGRIFOLIA.
- 4 Smoothish or downy, branched. Fl. stalks longer than cal...D. PEDICULARIA.
- 4 Very hairy. Lvs. pectinate-pinnat. Stalks shorter than cal. S..D. PECTINATA.

ORDER 93. LABIATÆ.—LABIATE PLANTS.

Herbs with square stems, and opposite, aromatic leaves.

Flowers axillary, in verticils, sometimes as if in spikes or heads.

Corolla labiate (rarely regular), the upper lip 2-cleft or entire, overlapping in the *bud*, the lower 3-cleft lip. *Stamens* 4, didynamous, or 2. *Ovary* deeply 4-lobed, forming in *fruit* 4 hard nuts or achenia.

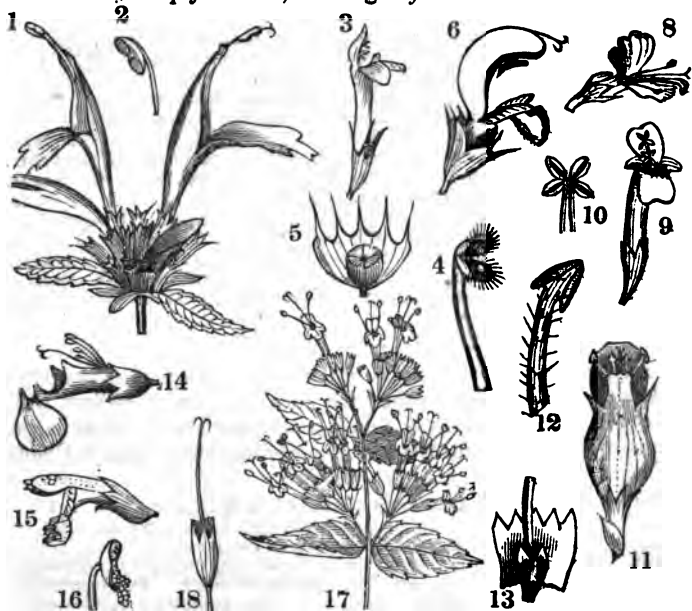


Fig. 241. 1, *Monarda didyma*. 2, An anther enlarged. 3, Fl. of Hemp Nettle (*Gallipsois*). 4, One of its stamens much enlarged. 5, The calyx opened, showing the 4 achenia. 6, Flower of Sage (*Salvia*). 7, Flower of *Ocimum basilicum*. 8, Flower of *Nepeta Glechoma*. 9, Flower of *Nepeta Glechoma*. 10, A pair of the anthers forming a cross. 11, Flower of *Physostegia Virginica* seen from beneath. 12, One of its stamens. 13, Its ovaries with the rudimentary filament. 14, Flower of *Teucrium Canadense*. 15, Flower *Nepeta Cataria* (*Catnep*). 16, One of its anthers. 17, *Cunila Mariana* (*Dittany*). 18, A calyx and style.

ANALYSIS OF THE GENERA.

- 1 Flowers with only 2 perfect stamens 8
- 1 Fls. with the 4 perfect stamens all declining towards the lower side 9
- 1 Flowers with the 4 perfect stamens not declining 2
- 2 Corolla nearly regular, with the four stamens equal 10
- 2 Corolla 2-lipped, with its upper pair of stamens longer 13
- 2 Corolla 2-lipped, with its lower pair of stamens longer 3
 - 3 Stamens straight, standing apart. Cor. upper lip flattish 7
 - 3 Stamens ascending by pairs beneath the concave or vaulted upper lip 4
 - 3 Stamens ascending and far projecting (exserted) on the upper side 23
- 4 Calyx 2-lipped, upper lip truncate and closed in fruit 17
- 4 Calyx more or less 2-lipped, 5-toothed, 13-ribbed 16
- 4 Calyx nearly regular, 3—10-toothed, 5—10-ribbed or veiny 5
 - 5 Calyx 3 or 4-toothed, the teeth not spinescent 18
 - 5 Calyx 5-toothed or lobed, the teeth not spinescent 6
 - 5 Calyx 5-toothed, the teeth ending in sharp spines 21
 - 5 Calyx 6—10-toothed, 10-ribbed 23
- 6 Corolla much longer than the calyx, swollen and inflated 19
- 6 Corolla tube shorter than the calyx, and not inflated 20
 - 7 Calyx hairy in the throat, mostly 2-lipped. Fls. in heads or spikes 14
 - 7 Calyx not hairy in the throat, mostly equal, 5-toothed 15
- 8 Calyx quite irregular, 2-lipped 11
- 8 Calyx nearly regular, 5-toothed 12
 - 9 Sta. included in long cor. tube, upper lip 2-lobed. † *Lavender*. LAVÁNDULA.
 - 9 Sta. involved in the lower lip of the corolla, upper lip 2-lobed. *S. Hyptis*.
 - 9 Sta. exserted. Cor. upper lip 4-lobed, lower entire. † *Sweet Basil*. OC'YUMUM.
 - 9 Sta. exser. Cor. gibbous at base. Shrubby. † *Sage*. GERANIUM. PLECTRÁNTHUS.
- 10 Corolla limb 4-lobed, the broadest lobe notched. *Peppermint*, &c. MÉNTHA. 1
- 10 Corolla limb equally 5-lobed, blue. *Blue False Gentian*. ISÁNTHUS.
 - 11 Sta. long-exserted. Fls. yellow. Sta. branched. *Horse Balm*. COLLINSÓNIA.
 - 11 Stamens exserted. Flowers purplish. Stems simple. BLEPHÍLIA.
 - 11 Stamens almost included. Anthers not halved. *Pennycroyal*. HEDEÔMA.
 - 11 Sta. included under the lip, anth. halved, lobes separated. *Sage*. SÁLVIA.
- 12 Herbs with the cor. nearly regularly 4-lobed. *Water Horehound*. LYCOPUS. 2
- 12 Herbs. Corolla slightly 2-lipped, stamens exserted. ... DILLANY. ... CUNILA.

- 12 Hrbs. Cor. upper lip linear, involving filaments. *False Balm*. MONÁRDA. 3
 12 Shrubs. Sta. ascending, with a tooth on upper side. *Rosemary*. ROSMARÍNA.
 13 Lvs. crenate, cordate. Cor. tube very broad, hairy inside. CEDRONÉLLA.
 13 Leaves crenate, cordate or reniform. Cor. tube smooth inside. NÉPETA. 4
 13 Lvs. serrate. Sta. all ascend. Fls. capitate. *Dragonhead*. DRACOCÉPHALUM.
 13 Lvs. serrate. Stamens diverging. Fls. spiked. *Tall Hyssop*. LOPHÁNTHUS.
 14 Cal. equal. 5-toothed. Lvs. hairy, ovate, acute. *W. Marjorum*. ORÍGANUM.
 14 Cal. 2-lipped. Lvs. obov.-oval, obtuse, white-downy. † *Marjorum*. MAJORÁNA.
 14 Cal. 2-lipped. Cor. up. lip erect. Lvs. green, ovate or nar. *Thyme*. THÝMUS.
 15 Cal. about 13-ribbed. Fls. in close heads, often corymb. PYCNÁNTHENUM.
 15 Cal. 10-rib. Cymes axil. Fls. pale violet. Sta. short. † *Sum. Savory*. SATURÉJA.
 15 Cal. 15-ribbed. Fls. axillary, blue. Stam. exserted. *Hyssop*. HISSÒPTUS.
 16 Flowers in close clusters, with awl-shaped bracts. Hairy... CLINOPÒDIUM.
 16 Fls. loose. Calyx woolly in the throat. Smooth or downy... CALAMÍNTHA.
 16 Fls. loose. Calyx naked in the throat. Leaves hairy, crenate... MELÍSSA.
 16 Fls. in terminal racemes. Peduncles oppos. Sta. exsert. S. CERÁNTHERA.
 17 Cal. lips entire. Lower anths. halved. Fls. axil. or racem. SCUTELLÁRIA. 5
 17 Calyx lips toothed. Filaments forked. Fls. in a short spike. PRUNÉLLA.
 18 Cal. 4-toothed. Filaments bearded, upper anthers united. W... SYNÁNDRA.
 18 Calyx 2-toothed. Anthers bristle-fringed, 2-lobed. S..... MACBRÍDEA.
 19 Cor. tube inflated in the midst, whitish. Lvs. lanceolate. PHYSOSTÉGIA.
 19 Corolla inflated at the throat, purple. Upper leaves clasping. LÁMIUM.
 19 Corolla inflated in the large, vaulted upper lip, purple..... PHLÓMIS.
 20 Cal. salver-form, 10-ribbed, as long as corolla. *Fetid Horehound*. BALLÓTA.
 20 Cal. broad bell-form, twice as large as corolla. † *Shell-flower*. MOLLUCÉLLA.
 21 Lvs. palmately lobed. Anther valves not fringed. *Motherwort*. LEONÓRUS.
 21 Lvs. serr. Cor. inflated in throat. Anths. bristly. *Hemp Nettle*. GALEÓPSIS.
 21 Lvs. toothed or crenate. Cor. throat not inflated. *Hedge Nettle*. STACHYS.
 22 Cal. 10-tooth. Lvs. crena.-toothed. Pl. white-downy. *Horehound*. MARRÚBIUM.
 22 Calyx 6—10-toothed. Lvs. entire. Corolla upper lip bearded. S.. LEUCAS.
 23 Sta. very long, arching the 5-lobed corolla. *Blue-curly*. TRICHOSTÉMA.
 23 Sta. exserted through a fissure in the upper lip. *Germander*. TRICRIUM.

1. MENTHA. MINT.

Calyx equally 5-toothed. Corolla nearly regular, tube included in the calyx, border 4-cleft, the upper lobe mostly notched. Stamens 4,

equal, straight, erect, distant.—Aromatic herbs, with the pale purple or white flowers in close axillary clusters, or forming spikes.

- 1 Whorls of flowers remote, axillary, not in spikes. Lvs. petiolate....2
- 1 Whorls of flowers approximate, forming terminal spikes....3
- 2 Plant grayish, fragrant. Lvs. acute at each end. *Wild-mint*. M. CANADENSIS.
- 2 Plant green, ill-scented. Lvs. frequently obtuse at base. *Field-m.* M. ARVENSIS.
- 3 Leaves petiolate. Spikes few, thick, short... *Peppermint*.....M. PIPERITA.
- 3 Leaves sessile. Spikes many, slender, long.... *Spearmint*....M. VIRIDIS.

2. LYCOPUS. WATER HOREHOUND.

Calyx tubular, 4—5-cleft. Corolla nearly regular, 4-cleft, tube as long as the calyx, stamens 2, distant, diverging, the length of the straight style.—4 Low herbs with deeply toothed or pinnatifid leaves, and remote axillary whorls of small, whitish flowers. *Jl., Aug.*

Stem obtuse-angled. Lvs. sharp-toothed. Calyx 4-cleft, blunt. L. VIROINICUS.
Stem sharp-angled. Lvs. sinuate-toothed. Calyx 5-cleft, spiny.. L. SINATUS.

3. MONARDA. MOUNTAIN-MINT.

Calyx tubular, lengthened, 15-ribbed, nearly equally 5-toothed. Corolla tubular, long, the lips linear or oblong, lower reflexed, 3-lobed, upper erect, entire, involving the filaments. Stamens 2, with rudiments of more.—Erect, fragrant herbs, with rather large flowers in bracted whorls or heads, the bracts generally tinged with the color of the flowers. *July—Sept.*

- 1 Leaves abrupt at base. Stamens and style exceeding the upper lip....2
- 1 Leaves tapering to the base. Stamens not exceeding the upper lip....3
- 2 Lvs. petiolate, ovate. Cor. bright red, 2' long. Bracts reddish. M. DIDYMA.
- 2 Lvs. petiol., lance-ovate. Cor. purpl. or whitish (very variab.). M. FISTULOSA.
- 2 Lvs. sessile, hairy. Cor. pale purple. Calyx teeth spiny. *W. M.* M. BRADBURIANA.
- 3 Downy. Lvs. and bracts lanceolate. Cor. yellowish, spotted. M. PUNCTATA.
- 3 Very glabrous. Lvs. and bracts lance-lin. Cor. yellowish. *S. M.* M. GRACILIS.

4. NEPETA. CAT-MINT.

Calyx striate, obliquely 5-toothed. Upper lip of the corolla notched or 2-cleft, lower 3-lobed, middle lobe largest, throat naked and widened. Stamens ascending beneath the upper lip.—4 Leaves crenate.

Cymes dense, forming terminal spikes. Lvs. cordate ovate. Erect. *N. CATÀRIA*.
Cymes loose, axillary. Leaves round-reniform. Trailing. *Gill. N. GLECHÔMA*.

5. SCUTELLARIA. SCULL-CAP.

Calyx campanulate, lips entire, with an appendage on the back and closed after flowering. Corolla with a long, ascending tube, the upper lip vaulted, nearly entire, middle lobe of the lower lip wide, spreading. Stamens approximate in pairs, ascending beneath upper lip.—Bitter herbs, not aromatic. Flowers generally blue. *May—Aug.*

- 1 Flowers in racemes, the floral leaves reduced to mere bracts....2
- 1 Flowers solitary, axillary. Leaves all similar, nearly sessile....5
- 2 Racemes terminal. Leaves petiolate. Flowers blue....3
- 2 Racemes axillary, and sometimes also-terminal. Flowers small....6
- 3 Plants hairy, or clothed with soft down, often whitish....4
- 3 Plants smooth or very nearly so. Racemes loose, leafy at base....8
- 4 Tall, erect (2—4f). Leaves mostly acute at apex, abrupt at base....9
- 4 Stems 1—2f high. Leaves rather obtuse at the apex....7
- 5 Hight 1—2f. Lvs. ovate-lanceo., acute, serr. Cor. large. *S. GALERICULÀTA*.
- 5 Hight 3—10'. Lvs. round, lance-ovate, obtuse, entire, small. *S. FÁRVULA*.
- 5 Hight 10'—20'. Lvs. lin., minutely pubes. Sts. simple. *S. S. ANGUSTIFOLIA*.
- 6 Lvs. broad-ovate, 3—5-veined, subsessile. Fls. few, opposite. *S. NERVOSA*.
- 6 Lvs. ovate, pointed, thin, petiolate. Fls. many, one-sided. *S. LATERIFLORA*.
- 7 Hairy. Lvs. rhomb.-ovate, distant, bracts spatul. Rac. short. *S. M. S. PILOSA*.
- 7 Wool-downy. Lvs. oval-ova., bracts ovate, petiolate. Rac. long. *S. M. S. RUGOSA*.
- 7 White-downy. Lvs. entire, lanceo. or lin., obtuse. Rac. leafy. *S. INTEGRIFOLIA*.
- 8 Lvs. acute, serrate, all tapering into pet.; bracts lanceolate. *S. W. S. SERRATA*.
- 8 Lvs. obtuse, crenate, ovate-corda.; bracts oblong. Sts. ascend. *W. S. SAXÁTILIS*.
- 9 Velvety. Lvs. obtuse or cordate at base; bracts oblong. *W. M. S. CANÉSCENS*.
- 9 Hairy. Lvs. deep-cordate at base; bracts ovate, sessile. *S. W. S. VERSICOLOR*.

ORDER 94. BORRAGINACEÆ.—BORRAGEWORTS.

Herbs, shrubs or trees with round stems and branches.

Leaves alternate, generally rough with stiff hairs. *Stipules* none.

Flowers seldom yellow, generally in a coiled (circinate) inflorescence.

Sepals 5. *Petals* 5, united below, almost always regular.

Stamens 5. *Ovary* deeply 4-lobed, forming in fruit 4 separate 1-seeded nuts or nutlets, generally without albumen.

ANALYSIS OF THE GENERA.

- 1 Corolla open at the throat, without scales....2
- 1 Corolla closed at the throat, with 5 little scales....3
- 2 Flowers blue or purple....8
- 2 Flowers white or yellow....9
- 3 Ovary and fruit smooth....4
- 3 Ovary and fruit prickly....7
- 4 Corolla funnel-form. Nuts excavated at the base....5
- 4 Corolla salver-form. Nuts flattish at the base....6
- 4 Cor. wheel-form, blue. Sta. converging. (See Fig.)† *Borrag*....BORRAGO.
- 4 Cor. tube-bell-form, whitish. Stam. included.† *Comfrey*. SYMPHYTUM officin.
- 5 Tube of the corolla straight.†.... *Garden Bugloss*....ANCHUSA officinālis.
- 5 Tube of the corolla curved..... *Wild Bugloss*....LYCOPSIS arpēnsis.
- 6 Flowers yellow, large. Nut white, smooth.. *W. PENTALOPHUS longiflorus*.
- 6 Fls. white or blue, small, lobes a little notched.. *Forget-me-not*.. MYOSOTIS. 1
- 7 Cor. salver-form, blue. Nuts prickly in rows. *Burr-seed*. ECHINOSPÉRUM.
- 7 Cor. funnel-form, purp., &c. Nuts prickly. *Hound-tongue*. CYNOGLOSSUM. 2
- 8 Cor. irregular, violet-purp. Sta. exserted. *Viper's Bugloss*. ECHIU M vulgāre.
- 8 Cor. regular, blue, tube-bell-form. Leaves smooth. *Lungwort*. MERTENSIA.
- 8 Cor. reg., blue, funnel-form. Lvs. rough.† *Lungwort*. PULMONARIA officinā.
- 9 Cor. oblong-tubular. Style long exserted. *False Gromwell*. ONOSMÓDIUM. 3
- 9 Cor. funnel-form, sometimes yell. Nuts bony. *Gromwell*. LITHOSPÉRUM. 4
- 9 Cor. salver-form, white. Style at top of ovary. *Turnsol*. HELIOTRÓPIUM.

1. MYOSOTIS. FORGET-ME-NOT. SCORPION-GRASS.

Calyx 5-cleft. Corolla salver-form, the 5 lobes slightly notched at the end, throat closed with 5 short, concave scales. Nuts smooth, ovate, with a small cavity at base.—Little herbs slightly woolly. Racemes finally becoming long. *May—Aug*.

Corolla bluish white, very small. Leaves oblong. Hight 6'—10'. *M. STRICTA*.
Corolla bright white, yellow in centre. Leaves oblong-linear.....*M. LAXA*.

2. CYNOGLOSSUM. HOUND'S-TONGUE.

Calyx 5-parted. Corolla short, funnel-form, the throat closed with 5 obtuse scales. lobes rounded. Nuts depressed, covered with

short, hooked prickles, fixed laterally to the base of the style.— Coarse herbs, strong-scented, with the flowers in leafless, paniced racemes. *June, July.*

Velvety. Stem leafy (1—2f). Flowers reddish purple.....*C. OFFICINALE.*

Hairy. Stem leafless above (2f). Flowers pale blue.....*C. VIRGINICUM.*

Hairy. Stem leafy (2—3f), wide-spread. Fls. whitish.....*C. MORISONI.*

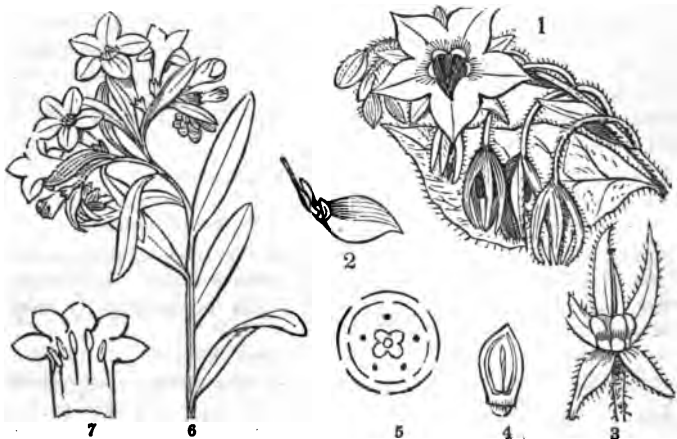
3. ONOSMODIUM. FALSE GROMWELL.

Calyx deeply 5-parted, with linear segments. Corolla oblong-tubular, half-5-cleft, segments erect and the throat open. Anthers sessile, included, style long exserted, smooth. Nuts shining, fixed by a flat base—4 with spiked, one-sided racemes of white flowers. *June—Aug.*

Close-bristly (1—2f). Corolla short, lobes slender.....*O. VIRGINIANUM.*

Shaggy-hairy (3—4f). Corolla twice longer than calyx.....*O. CAROLINIANUM.*

Close-downy (1—2f). Cor. lobes short, acute. Lvs obtuse.*O. MOLLE.*



242. Borrage (*Borrago officinalis*). 2, A petal with its scale and attached stamen. 3, Nuts with the style and calyx. 4, One of the nuts cut open, showing the seed, embryo, &c. 5, Plan of the flower. 6, Puccoon (*Lithospermum canescens*). 7, Corolla laid open, showing the stamens.

4. LITHOSPERMUM. GROMWELL.

Calyx 5-parted. Corolla funnel-form or salver-form, the limb 5-lobed, throat open. Stamens included. Nuts bony, ovate, smooth or wrinkled, fixed by a flat base.—Herbs generally with thick, reddish roots. Flowers spiked or racemed, with leafy bracts. *May—July.*

- 1 Flowers white or yellowish white....2
- 1 Flowers bright yellow, showy....3
- 2 Root ①, red. Leaves lance-linear. Nuts wrinkled, rough.....C. ARVENSE.
- 2 Root ②. Lvs. broad-lanceolate. Nuts smooth and polished...C. OFFICINALE.
- 2 Root ②. Lvs. ovate-lanceolate. Nuts smooth, punctate.....C. LATIFOLIUM.
- 3 Rough-hairy. Lvs. lance-linear. Cor. as long as calyx.....C. HIRTUM.
- 3 Hoary-downy. Lvs. oblong. Cor. thrice longer than calyx...C. CANESCENS.

ORDER 95. HYDROPHYLLACEÆ.—HYDROPHYLLS.

Mostly *herbs* with alterate lobed *leaves*, and regular bluish *flowers*.

Calyx 5-cleft, usually with appendages at the clefts, persistent.

Corolla 5-lobed, often with 10 honey scales or furrows near the base.

Stamens 5, inserted into the corolla, with a single bifid style.

Ovary simple, free, 1-celled, with 2 usually projecting several-seeded placentæ.

ANALYSIS OF THE GENERA.

- 1 Corolla with 10 honey scales inside, extending lengthwise....2
- 1 Cor. destitute of honey scales. Stamens equalling corolla. COSMANTHUS.
- 2 Fls. in coiled cymes, without bracts. Placentæ large, fleshy. HYDROPHYLLUM. 1
- 2 Flowers in one-sided racemes, bractless. Placentæ linear.....PHACELIA.
- 2 Fls. (mostly) solitary. Calyx very large. Leaves pinnatifid.....ELIÆSTIA.

1. HYDROPHYLLUM.

Sepals slightly united at base. Corolla campanulate, with 10 linear honey scales running lengthwise, folded inward so as to form 5 grooves. Stamens exserted. Pod globular, 2-celled, 1—4-seeded, with large, fleshy placentæ.—Handsome herbs, with the root leaves on long petioles, and the flowers in clustered cymes, bluish or white.

- 1 Calyx not appendaged. Stamens much exserted....2
 1 Cal. appendaged at the clefts. Sta. not exserted. *W.S.H. APPENDICULATUM.*
 2 Lvs. pinn.-veined and lobed, r'gh-hairy. Pedun. long. *W.S.H. MACROPHYLLUM.*
 2 Lvs. pinnately-veined and lobed, smooth. Peduncles long. *c. H. VIRGINICUM.*
 2 Lvs. palmat.-vein'd and lob'd, smooth. Ped. shorter than pets. *r. H. CANADENSE.*

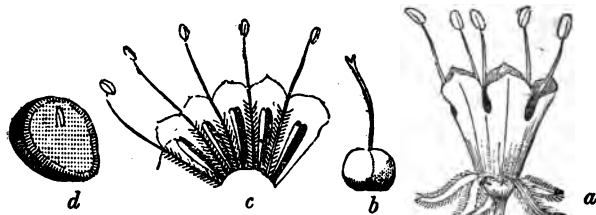


Fig. 243. *Hydrophyllum Virginicum*. *a*, A flower (enlarged). *b*, The ovary and style. *c*, Corolla laid open, showing the stamens, and the linear honey scales. *d*, A large seed cut open, with its little embryo.

ORDER 96. POLEMONIACEÆ.—PHLOXWORTS.

Herbs with alternate or opposite leaves, and regular, showy, 5-parted flowers, calyx free from the ovary, corolla of 5 united petals, twisted and imbricate in the bud, stamens 5, inserted into the midst of the corolla tube and alternate with its lobes, ovary 3-celled, styles united into 1, stigma 3'-cleft, capsule 3-celled, 3-valved; with few or many albuminous seeds.

ANALYSIS OF THE GENERA.

Corolla salver-shaped. Stamens unequally inserted within the tube. **PHLOX.** 1
 Corolla funnel-shaped. Stamens equally inserted at top of the tube. **GFLIA.**
 Cor. bell-shaped. Stamen valves closing the bottom of the tube. **POLEMONIUM.**

1. PHLOX. LYCHNIDEA.

Calyx angular, deeply 5-cleft, corolla salver-form, the tube more or less curved. Stamens quite unequal, inserted in the tube of the corolla above the middle. Capsule 3-celled, cells 1-seeded.—Very beautiful North American herbs. Leaves generally opposite, sessile, simple, entire. Flowers varying from purple to white. *Ap.—Jl.*

- 1 Lobes of the corolla (petals) rounded and entire at the apex....2
- 1 Lobes of the corolla notched or 2-cleft at the apex....9
- 2 Fls. many, in a cone-shaped or oblong panicle. Cal. short. Plants erect....5
- 2 Fls. fewer, somewhat corymbed. Plants creeping, ascending or erect....3
- 3 Plants very smooth and glabrous. Cal. teeth short-pointed, not bristly....6
- 3 Plants hairy or downy, especially the long-toothed calyx....4
- 4 Leaves linear or lance-linear, acuminate-pointed....7
- 4 Leaves oblong or lance-ovate, obtuse or scarcely acute....8
- 5 Smooth. Lvs. tapering to both ends. Panicle roundish. *W.S.†P. PANICULATA.*
- 5 Downy. Lvs. acumin. Cal. awn-toothed. Pan. cone-shaped. *S.†P. ACUMINATA.*
- 5 St. spotted. Lvs. broad at base. Cal. very short. Pan. oblong. *S.†P. MACULATA.*
- 6 Lvs. lance-ovate, acute, thin. Sepals united half-way up. *W.S. P. CAROLINA.*
- 6 Lvs. lance-linear, acumin., thick. Cal. teeth quite short. *W.—P. GLABERRIMA.*
- 7 Cal. teeth revolute. Lvs. broadest at base, often alternate. *†P. DRUMMONDII.*
- 7 Calyx erect. Leaves narrowed to the clasping base. *W.M.S....P. PILOSA.*
- 8 Hairy, low, with prostrate runners. Lvs. small, oblong. *W.S.†...P. REPENS.*
- 8 Downy, erect, slender. Leaves thin, broadest at base. *W.....P. LAPHAMII.*
- 9 Lvs. lance-ovate, thin. Petals merely notched. St. inclined. *P. DIVARICATA.*
- 9 Lvs. lance-linear, thick. Petals deeply 2-cleft. Stem low. *W....P. BIFIDA.*
- 9 Trailing, forming tufts. Lvs. linear-awl-shaped, stiff, fringed. *P. SUBULATA.*

ORDER 98. CONVULVULACEÆ.—BINDWEEDS.

Herbs twining or trailing, with alternate leaves and large showy flowers, *calyx* with 5 much imbricated sepals, persistent, *corolla* regular, 5-lobed or entire, plaited and twisted in the bud, *stamens* 5, and *style* single, *ovary* free, becoming in *fruit* a pod which is 2—4-celled and 2—6-seeded, *embryo* large and leafy, with thin mucilaginous albumen.

The Suborder, Cuscutæ, consists of small orange-colored, leafless plants, living on other plants (parasites), with small flowers, and no cotyledons!

ANALYSIS OF THE GENERA.

- 1 Plants leafy, green. Cotyledons 2, leafy, large....2
- 1 Plants leafless, orange-col'd. Cotyl. none. Parasitic. *Dodder. Cuscuta.*
- 2 Stamens exserted (projecting beyond the corolla)....3
- 2 Stamens included within the corolla tube....4

- 3 Calyx enclosed within 2 large leafy bracts. *Rutland Beauty*. CALYSTEGIA.
 3 Cal. naked. Sty. wholly united into one. *Morn. Glory, &c.* CONVULVUS. 1
 3 Cal. naked. Styles 2 or 3, nearly separate. Stem trailing. *W.S. STYLISMA*.
 4 Cor. tubular-cylindric, scarlet-col'd. Pod 4-celled. *Cypress-vine*. QUAMOCLIT.
 4 Cor. funnel-form. Pod 2- or partly 4-celled. *S. Good-night*. CALONYCTION.

1. CONVULVUS. BIND-WEED. MORNING-GLORY.

Calyx naked (not enclosed in bracts). Corolla bell- or funnel-form, with a spreading, nearly entire, 5-plaited border. Stamens mostly included. Ovary 2—4-celled, cells 1—2-ovuled. Style 1, stigmas 1, 2 or 3.—Mostly twining or trailing plants, often with a milky juice. *June—Sept.*

- 1 Stigmas 2, slender, ovary and pod 2-celled....6
 1 Stigmas 2, globular, or united into 1. Pod 2 celled....2
 1 Stigmas 3, united into 1 granulated head. Pod or ovary 3-celled....7
 1 Stigma 2-lobed, globular. Pod or the ovary 4-celled....8
 2 Corolla yellow or white, the tube sometimes purple inside....5
 2 Corolla either blue or purple....3
 3 Lvs. either entire or 3-lobed, cordate at base....4
 3 Lvs. roundish, notched or 2-lobed at the end. Fls. purple..C. PES-CLAPÆ.
 3 Lvs. digitate, 5—7-lobed, lobes petioled. Pedun. 1-flowered. C. CAROLINUS.
 4 Pedun. 1—2 flow'd. Lvs. smooth, arrow-shaped. Stem smooth. C. SAGITTATUS.
 4 Pedun. 3—4 fl'd. Lvs. downy, entire or 3-lobed. Stem downy. C. COMMUTATUS.
 4 Ped. bearing lvs. of fls. with lin. bracts. Fls. blue. St. hairy. C. TAMNIFOLIUS.
 5 Stem smooth. Lvs. cordate, acuminate. Fls. yellow, showy..C. CILIOSUS.
 5 St. hairy. Lvs. smooth, 7-lobed. Fls. white, little longer than cal. C. SINUATUS.
 5 St. whitish-downy. Lvs. numer., lin. Fls. white, small. M.S. C. PICKERINGII.
 5 St. smoothish. Lvs. entire or 3-lobed. Fls. white, small. W.S. C. LACUNOSUS.
 5 St. smooth. Lvs. often lobed. Fls. purp. in tube, limb white. C. PANDURATUS.
 6 Stem trailing. Lvs. arrow-shaped. Fls. white, 2 bracts below. C. ARVENSIS.
 6 St. hairy. Lvs. lance-obovate. Fls. 3-colored (blue, white, yellow).† C. TRICOLOR.
 7 St. hairy. Lvs. broad-cordate, entire. Fls. purp., large. S.†. C. PURPUREUS.
 7 Stem hairy. Leaves cordate, 3-lobed. Flowers white-purple.†....C. NIL.
 8 Leaves downy beneath, lobed or not. Flowers rose-white. S.W..C. JALAPA.
 8 Leaves smooth, obtusely lobed. Flowers yellowish-white. S. C. LITTORALIS.
 8 Lvs. hastate, angular, 5-veined. Fls. purp. or white. *Sweet Potato*. C. BATATAS.

ORDER 99. SOLANACEÆ.—NIGHTSHADES.

Plants herbaceous or shrubby, with alternate leaves, and with *flower-stalks* often opposite to the leaves and the pedicels without bracts, *calyx* generally persistent, 5-lobed, *corolla* 5-lobed, mostly regular, valvate and plaited in the bud; *ovary* free, 2-celled (rarely 3- or 4-celled), many seeded. *Style* and *stigma* single. *Fruit* a capsule or berry, with many seeds. *Embryo* curved, lying in fleshy albumen.

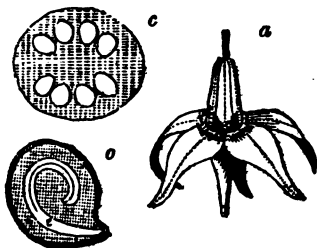


Fig. 244. *a*, A flower of *Solanum Dulcamara* (Bitter-sweet). *c*, Cross section of the berry. *o*, A seed cut open, showing the long curved embryo.

ANALYSIS OF THE GENERA.

- 1 Corolla regular, the lobes all equal....2
- 1 Corolla somewhat irregular. Stamens standing apart....3
- 2 Corolla wheel-shaped, tube very short. Stamens converging....6
- 2 Corolla funnel-shaped, tube long. Stamens standing apart....4
- 2 Corolla bell-shaped, the tube broad at the mouth....5
- 3 Cor. salver-form, white or purp., lower lobe largest. Trailing.† *PETUNIA*.
- 3 Cor. funnel-form, yellow, purp.-veined, upper lobe largest. *HYOSCYAMUS*.
- 3 Cor. wheel-form, lip-shaped, sta. declined, one horn-like. *S. ANDRÓCERA*.
- 4 Herbs. Fruit prickly. Cor. large, white or purple. *Stramonium*. *DATŪRA*.
- 4 Herbs. Fruit smooth. Cor. slender, yellowish or pink. *Tobacco*. *NICOTIANA*.
- 4 Shbs. with long, trailing branches. Berry 2-celled. *Matrimony Vine*. *Lycium*.
- 5 Sepals lanceolate, spreading in fruit. Berry naked. *Belladonna*. *AT'ROPA*.
- 5 Seps. arrow-shaped, leafy, enclosing the berry. *Apple of Peru*. *NICÁNDRA*.
- 6 Berry sitting on the spreading cal. Anth. open'g at top. *Potato*, &c. *SOLANUM*. 1
- 6 Berry enclosed in the bladdery calyx. Anth. splitting at side... *PHYSALIS*.
- 6 Fruit a dry pod, very acrid. *Cayenne* or *Red Pepper*.†.....*CÁPSICUM*.

1. SOLANUM. POTATO, &c.

Calyx 5—10-parted. Corolla rotate, limb spreading, tube very short, limb plaited in the bud, 5—10-lobed. Anthers erect, slightly united or converging, each opening at top by 2 pores. Berry 2—6-celled.—Herbs or shrubs unarmed or prickly. Leaves often 2-together, a large and a small one. Fls. generally lateral. *May—July.*

- 1 Herbs with the stem and leaves prickly....3
- 1 Herbs with the stem and leaves not prickly....2
- 1 Shrubs without prickles, smoothish....4
- 2 Leaves pinnate or pinnatifid....5
- 2 Leaves entire or merely waved on the margin....6
- 3 Flowers white or yellow....7
- 3 Flowers blue or purple....8
- 4 Stems long, trailing. Fls. clustered, purple. *Bitter-sweet*....S. DULCAMÁRA.
- 4 Stem erect. Fls. solitary, white.† *Jerusalem Cherry*....S. PSEUDO-CÁPSICUM.
- 5 Flowers bluish. Berries 2-celled. Root tuberous. *Potato*..S. TUBEROSUM.
- 5 Fls. greenish. Ber. large, 3—6-celled, colored. *Tomato*. S. LYCOSPÉRSICUM.
- 6 Smoothish. Lvs. ovate. Fls. white, ber. black. *Black Nightshade*. S. NIGRUM.
- 6 Hairy. Lvs. obovate, obtuse. Flowers purple. Plant small. S. S. HIRSUTUM.
- 7 Leaves cordate, angular-lobed. Flowers yellow. S.....S. MAMMOSUM.
- 7 Lvs. not cordate, angul.-lobed. Fls. white. S. W. *Horse-nettle*. S. CAROLINÉNSE.
- 8 Leaves pinnatifid, prickly both sides. Calyx prickly. S....S. VIRGINIANUM.
- 8 Lvs. ovate, downy. Calyx not prickly. Fr. large. *Egg-plant*. S. MELONGÉNA.

ORDER 100. GENTIANACEÆ.—GENTIANWORTS.

Herbs with opposite, entire, smooth leaves, and showy, regular flowers; corolla usually twisted in the bud, with as many lobes as stamens, and alternate with them, mostly persistent and withering; stigmas 1 or 2; ovary 1-celled, superior, becoming a 2-valved pod with many seeds.

ANALYSIS OF THE GENERA.

- 1 Lvs. opposite or whorled, sometimes minute. Cor. mostly twisted in bud..2
- 1 Lvs. alternate or radical. Corolla valvate in the bud....7
- 2 Corolla with a glandular spot on each lobe, sometimes with spurs....6
- 2 Corolla without glandular spots or spurs....3

- 3 Corolla tubular, the tube longer than the limb....4
- 3 Corolla deeply cleft, mostly wheel-shaped, tube very short....5
- 4 Seps. 4 or 5. Cor. fringed, or with folds betw. lobes. Anths. str'ght. *GENTIANA*. 1
- 4 Sepals 4 or 5. Anthers spirally twisted. *European Centaury*. *ERYTHRÆA*.
- 4 Sepals 2, leaf-like. Cor. 4-cleft, white or purplish. *Pennywort*. *OBOLARIA*.
- 5 Leaves very small or mere bracts. Fls. 4-parted. *Srew-stem*. *BARTONIA*.
- 5 Leafy. Fls. 5—12-parted. Anthers curved. *American Centaury*. *SABBATIA*. 2
- 6 Cor. 4-parted, with 4 spurs beneath at base. *Spurred Gentian*...*HALÆNIA*.
- 6 Cor. 4-parted, without spurs. Pl. tall, with whorled lvs. *Columbo*. *FRASERA*.
- 7 Cor. bearded inside. Lvs. 3-folia., on long stalks. *Buck-bean*. *MENYANTHES*.
- 7 Cor. smooth inside. Lvs. simple, floating. *Floating Heart*. *LIMNANTHEMUM*.

1. GENTIANA. GENTIAN.

Calyx 4—5-cleft. Corol-
l, 4—5-lobed, regular, usu-
ally with plaited folds be-
tween the lobes. Stigmas
2, style short or none. Pod
oblong, 2-valved, many-
seeded.—Leaves opposite.
Fls. solitary or in cymes.
Aug.—Oct.

Fig. 245. 1, *Gentiana Andrewsii*.
2, The calyx and capsule. 3, The cor-
olla laid open, showing the folds (2-
lobed) between the proper petals,
and the stamens attached at base. 4, Cap-
sule cut across. 5, Seed magnified,
with its large, loose testa.



- 1 Flowers 5—10-parted, whitish or yellow....7
- 1 Flowers 5—10-parted, blue or purple....2
- 1 Flowers 4-parted, lobes fringed, blue....3
- 2 Corolla club-shaped, lobes with folds between them....5
- 2 Corolla funnel-form, lobes with folds between them. Lvs. linear....6
- 2 Cor. funnel-shaped, lobes without folds between them. Lvs. lance-ovate....4

- 3 Up. lvs. ovate, connate-clasping, acute, rough-edged. Cal. long. *S. G. ACUTA.*
 3 Lvs. cordate, not connate, 5-7-v'ned, smoo'h-edg. Cal. short. *G. QUINQUEFLORA.*
 4 Cor. lobes never opening. Cal. lobes ovate. Lvs. lance-ovate. *S. ANDRÉWSII.*
 4 Cor. lobes slightly open. Cal. lobes lin. Lvs. broad or narrow. *S. SAPONARIA.*
 5 Fls. clustered. Folds of cor. entire. Pod finally stalked. *S. PNEUMONANTHE.*
 5 Fl. 1 only, terminal. Folds of the cor. toothed. Pod stalked. *S. ANGUSTIFOLIA.*
 6 Cor. whitish. Lvs. all narrowed to the base. Seed wingless. *S. OCHROLEUCA.*
 6 Corolla whitish. Leaves heart-clasping at base. Seeds winged.... *G. ALBA.*
 6 Cor. yellow. Lvs. ovate or oval. Cor. spreading, without folds.... *G. LUTEA.*
 7 Leaves lance-ovate. Cor. lobes deeply fringed, wedge-obovate. *G. CRINITA.*
 7 Lvs. lance-linear. Cor. lobes slightly fringed, oblong-spatulate. *G. DETONSA.*

2. SABBATIA. AMERICAN CENTAURY.

Calyx 5—12-parted, lobes slender. Corolla wheel-shaped, 5—12-parted. Stamens 5—12, anthers recurved. Style slender, 2-parted.—
 ② Beautiful slender herbs, with large, paniced or cymose rose or white flowers. *June—Aug.*

- 1 Corolla 5- or rarely 6-parted.... 2
 1 Corolla 7—12-parted, purple or rose-colored.... 5
 2 Branches opposite, several-flowered, peduncles short.... 3
 2 Branches alternate or forked, peduncles slender, 1-fr'd. Fls. purp.-yel... 4
 3 Fls. white, in flat-topped cyme. Lvs. lance-ova. St. simp. *S-E. S. CORYMBOSA.*
 3 Fls. purp., with a greenish star. St. square. Lvs. ovate-clasping. *S. ANGULARIS.*
 3 Fls. rose, with yel. star. St. slender. Lvs. lance-linear, sessile. *W. S. CONCFINNA.*
 3 Flowers purple, numerous, in a long, narrow panicle. *S. S. BRACHIATA.*
 4 Lvs. lance-ovate or oblong. Sepals shorter than the petals. *S. STELLARIS.*
 4 Lvs. lance-linear. Sepals as long as the petals, bristle-form. *S. GRACILIS.*
 5 Fls. long-stalked, 9—11-parted, petals large, longer than sepals. *S. CHLOROIDES.*
 5 Fls. long-stalked, 7—9-parted, petals shorter than the sepals.... *S. CALYCOSA.*
 5 Fls. sessile, axillary, 9—12-parted. Lvs. linear, long. *S. S. GENTIANOIDES.*

ORDER 101. APOCYNACEÆ.—DOGBANES.

Trees, shrubs and herbs with a milky juice, entire leaves, flowers 5-parted and regular, with the corolla twisted in the bud, stamens 5, with distinct filaments, anthers sometimes slightly united, ovaries 2, distinct, but with their stigmas united at top of the styles, fruit 2 follicles containing several or many albuminous seeds.

ANALYSIS OF THE GENERA.

- 1 Herbs erect, with white or bluish-colored fls. Seeds silky *APOCYNUM*. 1
 1 Herbs erect, with blue fls. Cor. tube closed. Sds. naked. *S.W.* *AMBONIA*.
 1 Herbs climbing, with white and yellow fls. Seeds silky. *S.* *ECHITES*.
 2 Shrubs with opposite leaves and bluish-purple fls.†... *Periwinkle* *VINCA*.
 2 Shrubs with lvs. in whorls of 3s, and large rose-red fls. *Oleander*. *NERIUM*.

APOCYNUM. DOG'S-BANE.

Calyx very small, corolla campanulate, lobes short. Stamens shorter than the corolla, arising from its base and alternate with 5 glandular teeth. Anthers arrow-shaped, cohering to the stigmas by the middle. Ovaries 2. Follicles long, slender, separate. Seeds with a tuft of long, silky down.—Herbs with opposite entire leaves, and small flowers in cymes. *Jn.*—*Aug.*

Fig. 246. 1, *Apocynum androsaemifolium*. 2, A flower of the natural size. 3, The flower cut open, showing the peculiar stamens. 4, The 2 styles and stigmas. 5, The plan of the flower. 6, The 2 follicles. 7, A seed with its tuft of silk.



- 1 Corolla greenish-white, but little longer than calyx. Leaves oblong.... 2
 1 Cor. rose-white, much longer than cal. Lvs. ovate. *A. ANDROSAEMIFOLIUM*.
 2 Lvs. obtuse at each end, petiolate, often downy beneath..... *A. CANNABINUM*.
 2 Lvs. cordate, almost sessile, acute, upper acute both ends. *A. HYPERICIFOLIUM*.

ORDER 102. ASCLEPIADACEÆ.—ASCLEPIADS.

Plants (chiefly *herbs* in the United States) with a milky juice, *leaves* opposite (rarely whorled or scattered), entire, without stipules, *flowers* generally umbels, 5-parted, regular, *sepals* and also the *petals* united at base, both commonly valvate in the bud, *stamens* united, with the anthers covering over the two stigmas, *pollen* cohering in masses, *ovaries* 2, forming *follicles* in fruit.

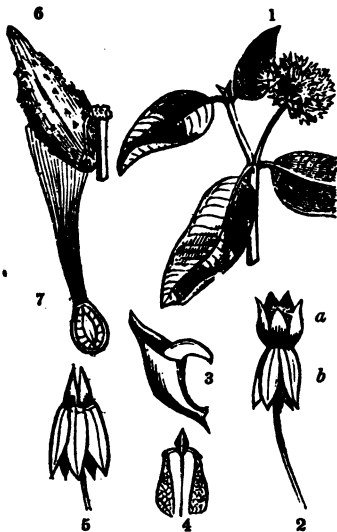


Fig. 247. 1, *Asclepias Cornuti*. 2, A single flower; *a*, the crown, *b*, the petals. 3, One of the hoods (magnified) of the crown, with the little horn from within it. 4, A pair of pollen masses separated from the anther and magnified. 5, A flower with the stamens and crown removed, showing the 2 stigmas. 6, A mature pod (diminished in size). 7, A seed with its silky tuft.

ANALYSIS OF THE GENERA.

- 1 Stems erect or ascending, 1—5f high. Flowers in umbels....3
- 1 Stems twining and climbing. Flowers in racemes, cymes, &c....2
- 2 Leaves broad, heart-shaped at base, petiolate....5
- 2 Leaves not heart-shaped at base, ovate or linear....6
- 3 Corolla lobes reflexed or reflex-spreading....4
- 3 Corolla lobes erect. Lobes of the crown hornless. *S*.....*PODOSTIGMA*.
- 4 Hoods of the crown with a little horn from within each.....*ASCLEPIAS*. 1
- 4 Hoods of the crown concave, erect, and each destitute of a horn. *AGERATES*. 2
- 5 Smooth. Fls. whitish. Cor. lobes erect. Hoods each 2-awned. *ENSLÉNIA*.
- 5 Hairy. Fls. dark purple. Corolla flat, twisted in the bud. *GONÓLOBUS*.
- 6 Lvs. ovate, &c. Fls. brown-purp., 5 awned scales. Fil. distinct.† *PERIPLÔCA*.
- 6 Lvs. linear, long. Fls. greenish, crown 5-leaved. Fil. united. *S. SEUTERA*.

1. ASCLEPIAS. SILK-GRASS. MILK-WEED.

Calyx and corolla deeply 5-parted, valvate in the bud, finally reflexed. Crown of 5 hooded lobes, each containing a little horn curved towards the stigmas. Filaments united into a tube covering the stigmas. Pollen masses waxy, pear-shaped, flattened, in pairs, contained within the 5-angled mass of anthers, pendulous. Pods (follicles) 2, seeds with a silky tuft of hairs.—4 Leaves mostly opposite. Umbels between the petioles. *June—Aug.*

- 1 Leaves linear, long and narrow....7
- 1 Leaves broader, lanceolate, ovate, &c....2
- 2 Stems simple or very nearly so....3
- 2 Stems paniculately branched....8
- 3 Leaves petiolate, the petioles often very short....4
- 3 Leaves sessile and sometimes stem-clasping....9
- 4 Flowers more or less deeply purple....10
- 4 Flowers, or especially the crown, white....5
- 5 Leaves all opposite....6
- 5 Leaves in the middle of the stem 4-whorled. Flowers small....11
- 6 Leaves (especially the upper) tapering and acute at base....12
- 6 Leaves nearly all rounded or subcordate at base....13
- 7 Lvs. whorled, crowded, smooth. Umbels small, lateral. *A. VERTICILLATA*.
- 7 Lvs. scattered (the lower opposite, spatulate). Umb. term. *S. A. MICHAUXII*.
- 7 Leaves all opposite. Umbels terminal. Horns included. *S. A. CINERA*.
- 7 Lvs. opposite. Umbels terminal. Crown yellow. *r. M. S. A. PAUPERULA*.

- 8 Lvs. scattered. Flowers orange-yellow, hairy. Hight 1—2f. *c.* *A. TUBEROSA*.
 8 Lvs. opposite, petiolate. Fls. flesh-purple, smooth. Ht. 2—3f. *c.* *A. INCARNATA*.
 9 Lvs. very obtuse, sessile. Umbel 1 only, terminal. *M. W.* *A. OBTUSIFOLIA*.
 9 Lvs. obtuse, clasping. Umbels several, lateral. *S.* *A. AMPLEXICAULIS*.
 9 Lvs. acute, sessile. Umbels lateral. Pods soft-spiny. *W.* *A. SULLIVANTII*.
 10 Corolla greenish-purple. Pods weak-spiny. *Very common.* *A. CORNUTI*.
 10 Cor. dark-purple. Pods smooth. Horns bent horizontal. *r.* *A. PURPURASCENS*.
 10 Corolla red-purple. Pods smooth. Horns nearly erect. *r. M.S.* *A. RUBRA*.
 11 Leaves ovate, rounded at base. Umbels long-stalked. *A. QUADRIFOLIA*.
 11 Leaves lanceolate, acute at base. (A variety ?) *W.* *A. LANCEOLATA*.
 12 Leaves broad-ovate, large. Umbels large, terminal. *r.* *A. PHYTOLACCOIDES*.
 12 Leaves lanceolate, small. Umbels small, terminal. *M.W.S.* *A. PARVIFLORA*.
 12 Leaves lanceolate. Umbels lateral. Stem downy. *S.* *A. NIVEA*.
 13 Lvs. acute at base, smooth. Horns bent horizontal. *M.S.* *A. VARIEGATA*.
 13 Lvs. subcordate at base, velvety. Horns hooked. *S.* *A. OBOVATA*.

2. ACERATES. HORNLESS MILKWEED.

Flowers like those of *ASCLEPIAS*, except that the hoods of the crown are destitute of the little horns which distinguish that genus.
 —Herbs 4 with the leaves generally opposite and the greenish flowers in umbels. *May—July*.

- 1 Umbels sessile (not raised on stalks)....3
 1 Umbels raised on longer or shorter stalks....2
 2 Leaves ovate or oblong or elliptical....4
 2 Lvs. linear, 3'—5' long, scattered. Peduncles short. *W. S.* *A. LONGIFOLIA*.
 3 Leaves elliptic, varying to oblong and lanceolate. *c.* *A. VIRIDIFLORA*.
 3 Leaves linear, rough, margin often revolute. *S.* *A. ANGUSTIFOLIA*.
 4 Stem erect, smooth. Leaves petiolate, often scattered. *S.* *A. PANICULATA*.
 4 Stem erect, a little downy. Leaves sessile, opposite. *S.* *A. CONNIVENS*.
 4 Stem decumbent, hairy, 4'—6' long. Leaves scattered. *S.* *A. LANUGINOSA*.

CHAPTER III.

OF THE APETALOUS EXOGENS.

Essential Character.—Flowering Plants (PHÆNOGAMIA), with their stems growing by additions to the outside and the wood in circular layers (EXOGENS), with the seeds enclosed in seed-vessels (ANGIOSPERMS), and the flowers destitute of petals (APETALÆ).

ORDER 110. POLYGONACEÆ.—BUCKWHEATS.

Herbs with alternate *leaves* and stipules in the form of sheaths above the swollen joints of the stem, *flowers* generally perfect, racemed, with *calyx* persistent, sepals united at base and imbricated in bud, with no *corolla* and a definite number (4—12) of stamens, with a 1-celled, 2- or 3-styled *ovary*, bearing in fruit a single seed.

ANALYSIS OF THE GENERA.

- 1 Sepals either 4 or 6, the outer reflexed, inner enclosing the fruit....2
- 1 Sepals 5 (rarely 4), about equal, all erect, enclosing the fr. POLYGONUM. 1
- 2 Sepals 4. Stam. 6. Stigmas 2. Lvs. round-reniform, sour. *Mis. r. OXYRIA.*
- 2 Sepals 6. Stam. 6. Styles 3. Coarse hbs. Fls. greenish. *Sorrel Dock. RUMEX.*
- 2 Sepals 6. Stam. 9. Styles 3. Large, sour hbs. Fls. white. *Pie-plant. RHEUM.*

1. POLYGONUM. KNOT-WEED.

Calyx 5- (rarely 4-) parted, colored or corolla-like, the sepals all erect and enclosing the fruit. Stamens 4—9. Styles 2 or 3. Nut lens-shaped or 3-cornered.—Herbs with swollen joints. Pedicels usually jointed to the flower. *May—Aug.*

- 1 Leaves all cordate or arrow-shaped at base. Stamens 6—8....9
- 1 Leaves at base acute or rounded, very rarely a little cordate....2
- 2 Flowers all in the axils of the leaves, with 3 styles....8
- 2 Flowers collected into spikes or racemes with 2 or 3 styles....3

- 3 Flowers with 5 stamens and 2 styles. Lvs. ovate or lance-ovate....17
 3 Flowers with 6—9 stamens and 2 or 3 styles....4
 4 Leaves linear or thread-shaped. Spikes slender. Styles 3....16
 4 Leaves lanceolate, rarely ovate or spatulate....5
 5 Styles 2 (or sometimes 3 when the plant tastes very acrid)....6
 5 Styles 3, nut 3-cornered (plants scarcely at all acrid)....7
 6 Plants smooth all over (or the stalks slightly rough)....13
 6 Plants hairy or glandular-bristly, at least the stalks....12
 7 Stem smooth (the stipules fringed). Spikes slender....14
 7 Stem hairy. Spikes many, slender. Southern....15
 8 Stem and branches upright or nearly so....11
 8 Stem and branches prostrate, diffuse. Leaves small....10
 9 Stem not twining, smooth or climbing with reversed prickles....18
 9 Stem twining and climbing, but not prickly....19
 10 Lvs. green, not fleshy. Nut wholly enclosed in the calyx. *c.* P. AVICULARE.
 10 Leaves glaucous, fleshy. Nut longer than the cal., shining. *r.* P. GLAUCUM.
 11 Lvs. oval, large. Sta. 5. Branches few, 1—2½ high. *c.* M. W. P. ERECTUM.
 11 Lvs. lanceol. Stam. 8. Branches many, 3½ high *r.* W. P. RAMOSISSIMUM.
 11 Lvs. linear, sessile, sharp-pointed. Branches ½—1½ high. *r.*.... P. TENNE.
 12 Rather hairy, 6—8½ high. Lvs. ovate. Spikes drooping, red. *†* P. ORIENTALE.
 12 Glandular-bristly, 3—5½ high. Lvs. lanceol. Spikes drooping. *P.* CAREYI.
 12 Sm'th below (2—3½ high), stalks gland.-bristly, erect. P. PENNSYLVANICUM.
 13 Lvs. lanceolate, with 1 dark spot. Styles half united. *c.* P. PERSICARIA.
 13 Lvs. lance-ovate, all green. Styles separate, diverg. *r.* P. LAPATHIFOLIUM.
 13 Lvs. lanceolate, with transparent dots, intensely acrid. *c.* P. PUNCTATUM.
 14 Spikes several. Lvs. lanceolate. Stipules fringed with long hairs. P. MITE.
 14 Spike 1 only, sometimes bearing bulblets. Lvs. lanceol. *Mis. r.* P. VIVIPARUM.
 14 Spikes numerous, paniced. Lvs. spatulate. Plant shrubby. S. P. POLYGAMA.
 15 Hairy all over. Lvs. dotted. Stamens 7. Stalks 1-spiked. S. P. HIRSUTUM.
 15 Hairy except the stem. Stamens 8. Stalks long, 2-spiked. S. P. SETACEUM.
 16 Lvs. glaucous, linear spatulate. Fls. rose-colored, nodding. S. P. GRACILE.
 16 Lvs. green, linear, acute at each end. Fls. white, fringed. S. P. FIMBRILATUM.
 16 Lvs. green, lin.-thread-form. Fls. greenish-white, nodding. P. ARTICULATUM.
 17 Spikes thick, short. Seps. 5, equal. St. prost. at base. *Wel. P.* AMPHIBIUM.
 17 Spikes thin, slender, long. Seps. 4, unequal. St. erect. W. P. VIRGINICUM.
 18 Smoothish, erect. Fls. white, paniced. Stam. 8. *Buckwheat.* P. FAGOPYRUM.
 18 Prickly backwards. Fls. racemed. Stamens 6. Lvs. hastate. *c.* P. ARIFOLIUM.
 18 Prickly backwards. Fls. capitate. *Sta. 8.* Lvs. sagittate. *c.* P. SAGITTATUM.
 19 Roughish. Lvs. heart-hasta. Fls. racem. Joints smo'h. *c.* P. CONVOLVULUS.
 19 Downy. Lvs. cordate. Racemes paniced. Joints bristly. *r.* P. CILINDRE.
 19 Smooth. Lvs. cordate. Rac. leafy. Sepals winged in fruit. *c.* P. SCANDENS.

ORDER 111. PHYTOLACCA CÆ.—POKEWEEDS.

Herbs or shrubs with alternate leaves, no stipules, and flowers racemed, sepals colored, 4 or 5, petals none, stamens few or many, ovary of one or several carpels which are united into a ring forming a berry in fruit, cells as many as the carpels, each 1-seeded, embryo curved around the fleshy albumen.

ANALYSIS OF THE GENERA.

Sep. 5, roundish. Sta. 5—20. Ovary 5—12-carpeled and seeded. PHYTOLACCA. 1
Sepals 4, persistent. Sta. 4—12. Ovary 1-carpeled and 1-seeded. S. RIVINA.

1. PHYTOLACCA. POKE.

Character expressed in the Analysis.—Tall and stout perennials, with greenish flowers and purple berries.

P. DECANDRIA. Plant 5—8f high, very smooth, bushy. Lvs. large, ovate, acute at each end, petioled. Racemes at first terminal, finally opposite to the leaves. Berries round-depressed, of a rich dark purple. July—Sept.

Fig. 248. *Phytolacca decandria*, leaves, flowers and fruit. a, A flower, natural size. b, Its stamens and ovary. c, Cross section of the ovary. d, A seed cut open, showing the embryo coiled around the albumen.



ORDER 125. BETULA CÆ.—BIRCHWORTS.

Trees or shrubs with deciduous stipules, with leaves alternate simple, having the veinlets running straight to the margin, with flowers monœcious, both kinds contained in scaly catkins, 2 or 3 under each bract, calyx and corolla hardly any, ovary 2-celled and 2-ovuled, but becoming in fruit a 1-celled and 1-seeded nut, by the suppression of the other seed and cell.

ANALYSIS OF THE GENERA.

♂ bracts with 12 stam. each; ♀ bracts with mostly 3 ovaries. *Birch*. BÉTULA. 1
 ♂ bracts with 4—8 sta. each; ♀ bracts with 2 ova. or fis. each. *Alder*. ALNUS

1. BETULA. BIRCH.

♂ in a cylindrical catkin, bracts each with 3 tetrandrous flowers beneath it. ♀ in an oblong or egg-shaped catkin, bracts 3-lobed, each with 3 2-styled ovaries or flowers, with no calyx. Samara flattened, broadly winged.
 — Trees and shrubs mostly with the outer bark in thin layers with horizontal fibres. Catkins appearing in early spring before the leaves.



Fig. 249.

Fig. 249. *Betula lenta* (Sweet Black Birch), with staminate and pistillate catkins. ♂ a scale with staminate flowers. ♀ with pistillate flowers.

Fig. 250. a, A winged samara cut lengthwise, with its fertile and abortive cell. b, The same cut across.



- 1 Shrubs with brownish bark and roundish, crenate leaves....4
- 1 Trees with reddish-brown bark, and ovate, doubly-serrate leaves....3
- 1 Trees with white bark, long-stalked leaves and stalked catkins....2
- 1 Trees with yellowish bark and heart-ovate, serrate leaves....B. EXCELSA.
- 2 Lvs. deltoid, taper-pointed, unequ. serra., smooth and shining. B. POPULIFOLIA.
- 2 Lvs. ovate, often cordate, pointed, doubly-serrate, dull green. B. PAPYRACEA.
- 3 Lvs. rhombic-ovate, whitish-downy beneath, acute at each end. B. NIGRA.
- 3 Lvs. heart-ovate, hairy on the veins beneath, acuminate.....B. LÉNTA.
- 4 Erect, 2—4f high. Lvs. round-ovate. ♀ catkins cylindrical..B. PÚMILA.
- 4 Trailing, 6'—20'. Lvs. round, small (¼' broad). ♀ catkins oblong. B. NANA.

CHAPTER IV.

OF THE AGLUMACEOUS ENDOGENS.

Essential Character.—Flowering plants (PHÆNOGAMIA), with their stems growing by additions made to the inner part and having no distinction of bark, pith and layers of wood (ENDOGENS), and with the flowers destitute of glumes (AGLUMACEÆ). The leaves are generally parallel-veined, and the flowers 3-parted.

ORDER 134. ARACEÆ.—AROIDÆ.

Chiefly *herbs* with a fleshy rootstock or corm, *leaves* sometimes net-veined, *flowers* mostly without calyx or corolla, arranged on a spadix, *stamens* few or many, hypogynous, very short, anthers turned outward, *ovary* free, stigmas sessile, fruit a dry or juicy berry, and the *seeds* with or without albumen.

ANALYSIS OF THE GENERA.

- 1 Spadix surrounded by a spathe....2
- 1 Spadix destitute of a spathe. Sepals 4—6....4
- 2 Flowers covering the whole spadix....3
- 2 Fls. covering only the base of the spadix. Berry 1-celled, 00-seeded. ARUM. 1
- 2 Fls. staminate at top of spadix, pistillate at base, mid. naked. S. CALADIUM.
- 3 Fls. monœcious, with no calyx. Spathe long, rolled, green.. PELTANDRA.
- 3 Flowers perfect, with no calyx. Spathe open, reflexed, white... CÁLLEA. 2
- 3 Fls. perfect, with a 4-parted cal. Spathe hooded, spotted. SYMPLOCÁRPUS.
- 4 Spadix on side of a leaf-like scape. Lvs. sword-shaped. *Sweet flag*. AC'ORUS.
- 4 Spadix on the top of a round thick scape. Flowers yellow.....ORÓNTIUM.

1. ARUM. INDIAN TURNIP. DRAGON-ROOT.

Flowers sometimes ♂ ♀. Spathe hooded, rolled at base. Calyx and corolla 0. Spadix club-shaped, naked above, staminate below

the middle, and pistillate at base. Berry 1-celled, many-seeded.—4 herbs.

Lf. generally but 1, foot-shaped, with 7—9 lfts. Spathe green. *A. DRACONTIUM*. Lvs. 2, each with 3 ovate lfts. Spathe mostly striped within... *A. TRIPHYLLUM*. Leaves several, each with 5 lanceolate leaflets. *Southern*..... *A. QUINATUM*. Lvs. several, simple, with 3 acute angles, arrow-shaped at base. *S. A. WALTERI*.

2. CALLA.

Flowers with no calyx. Spathe ovate, white inside, mostly reflexed. Spadix covered with flowers, which are either all perfect or the upper staminate. Berry many-seeded.—4 Smooth and handsome herbs growing in water. *June, &c.*

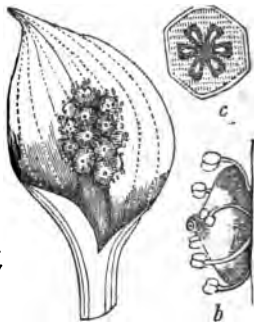


Fig. 251. *Calla palustris*, its spathe, spadix and flowers. *b*, One of the flowers, consisting of an ovary surrounded by six stamens. *c*, Cross section of the ovary.

Creeping, lvs. broad-cordate. Scape 4'—6'. Fls. mostly ♀. Native. *C. PALUSTRIS*. Erect, tall, leaves arrow-cordate. Scape 3—5f. Upper fls. ♂. †. *C. ÆTHIOPICA*.

ORDER 138. ALISMACEÆ.—ALISMADS.

Herbs growing in water, with the leaves parallel-veined, and with the flowers regular and not on a spadix, the perianth consisting of sepals and petals, 3 of each, the former always green, stamens few or many, ovaries several or many, distinct or coherent, each carpel 1-seeded, fruit dry, not opening, seeds with no albumen.

ANALYSIS OF THE GENERA.

- 1 Both the calyx and corolla greenish. Lvs. rush-like... 2... (*Juncagineæ*.)
- 1 Corolla colored, white. Leaves mostly with a lamina.... 3
- 2 Anthers thick. Ova. 3—6, united. Lvs. radical, scape naked. *TRIGLOCHIN*.
- 2 Anths. linear. Ovaries 3, nearly distinct. Lvs. sheathing... *SCHUCHZERIA*.

- 3 Fls. ♀. Stam. 6. Carp. numerous, whorled. *c. Water Plantain.* ALISMA. 1
 3 Fls. ♀. Stam. 7—21. Carpels in a head. Lvs. narrow. *r. ECHINODORUS.*
 3 Fls. ♂. Sta. many. Lvs. generally arrow-shap. *c. Arrow-head.* SAGITTARIA. 2

1. ALISMA. WATER PLANTAIN.

Flowers perfect. Stamens 6. Ovaries and styles numerous, collected into a whorl, becoming in fruit many distinct, flattened achenia.—4 Stemless herbs, the leaves all radical. Flowers in a panicle.

A. PLANTAGO. A common, smooth, handsome inhabitant of ponds and ditches. Leaves oval or ovate, abruptly acuminate, 7—9-veined, entire, on long petioles. Scape 1—2f high, branching in whorls, bearing numerous purplish-white flowers, in July.

2. SAGITTARIA. ARROW-HEAD.

Flowers monœcious, rarely diœcious, the ♂ with about 24 stamens, the ♀ with numerous ovaries crowded in a head, and becoming in fruit as many compressed, margined achenia.—4 Stemless plants, leaves radical, generally arrow-shaped. Flowers in whorls of 3s, the sterile ones above the fertile.

S. SAGITTIFOLIA. A curious plant, conspicuous with its large white flowers among the rushes and sedges of sluggish waters. The petals are wholly white, and the scape simple, with the stalks 1-flowered. The leaves are generally arrow-shaped (as seen in the figure), but exceedingly variable, sometimes lanceolate, and sometimes even consisting of a petiole only. Generally about 1f high. *July.*

Fig. 252. *Sagittaria sagittifolia* (common form), leaf and flowers. *a*, One of the pistils enlarged. *b*, The pistil of *Alisma* cut open, showing the seed and curved embryo.



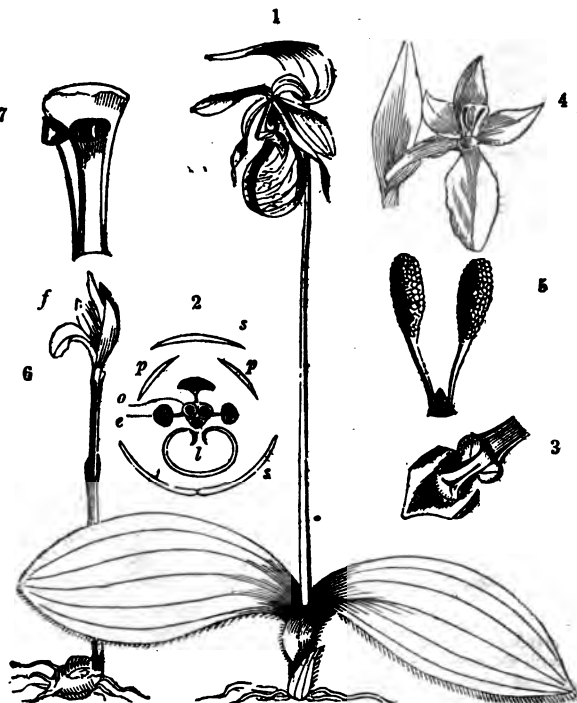


Fig. 253. 1, Ladies'-slipper, (*Cyripedium acaule*), whole plant, with its 2 leaves, scape and curious flower. 2, Plan of the flower; *s*, sepals (outer circle), the 2 lower united; *p*, the petals; *l*, lip (lower petal); *a*, the anthers, upper one sterile; *o*, the 3-celled ovary. 3, The column seen from beneath, with the pistil, two stamens and the leaf-like sterile one. 4, Flower and bract of *Orchis spectabilis*. 5, Its 2 pollen masses exhibited (enlarged). 6, *Arethusa bulbosa*; *f*, the flower. 7, Its column enlarged, with its lid-like anther open, showing the 4 pollen masses beneath.

ORDER 140. ORCHIDACEÆ—ORCHIDS.

Herbs perennial, with thick, fleshy roots, entire, parallel-veined leaves. *Flowers* very irregular, but the perianth consisting always of 6 parts, viz., of 3 *sepals* and 3 *petals*, all usually colored, the lower petal called the *lip* differing in form from the others, and frequently spurred at base, *stamens* 3, but only 1 or rarely 2 of them perfect, united with the style and forming what is called the *column*; *anthers* 2, 4 or 8-celled, *pollen* powdery, or waxy, or granulated; *ovary* 1-celled, many-seeded.

ANALYSIS OF THE GENERA.

- 1 Stems green, furnished with one or more leaves....2
- 1 Stems green, furnished with sheaths instead of leaves....8
- 1 Stems brownish, furnished with sheaths and no lvs. or a late one....7
- 2 Corolla lip very large, inflated and sack-like....13
- 2 Corolla lip of various forms but neither very large nor sack-like....3
 - 3 Corolla produced into a spur behind....9
 - 3 Corolla destitute of a spur....4
- 4 Flowers many, small, in a loose raceme....6
- 4 Flowers many, small, in a close spike....5
- 4 Flowers few or one only, showy, scarcely racemed....10
 - 5 Flowers white, spirally arranged in the spike....11
 - 5 Flowers yellow or purplish? *Southern*....12
- 6 Lip cordate or arrow-shaped. Fls. greenish. Leaf 1 only..MICRÓSTYLIS.
- 6 Lip broad and entire. Fls. greenish or purplish. Lvs. 2 only....LÍPARIS.
- 6 Lip flat, 2-lobed. Fls. greenish, &c. Lvs. 2, in middle of stem..LISTERA.
 - 7 Root coraline. Spur growing to the ovary. Lvs. none...CORALLORHIZA. 1
 - 7 Root bulbous. Spur none. Leaf 1, late, green in winter...APLECTRUM.
- 8 Fls. 00, brownish-purpl. Lip beardless. (Sometimes a few lvs.) S. BLÆTIA.
- 8 Fl. one only, handsome, rose-purple. Lip bearded. *In bogs*....ARETHUSA. 3
 - 9 Flowers without bracts. Masses of pollen 4. Leaf 1 only...TIPULÀRIA.
 - 9 Fls. in the axils of bracts. Pollen masses 2. Lvs. 1, 2 or many. ORCHIS. 3
- 10 Fl. one, rarely more, lip on the lower side, bearded, Lvs. 1—5. POGONIA. 4
- 10 Fls. several, lip on upper side, bearded. Lf. one, sword-shape. CALOPOGON. 5

- 11 Lateral sepals ascending. Lip pointless. Lvs. wholly green. *SPIRÁNTHEs*. 6
 11 Lat. sepals erect. Lip strap-pointed. Lvs. with netted lines. *GOODYERA*.
 12 Petals yel., spread. Grows on trees. Lvs. 2, thick, veiny. *S. EPIDENDRUM*.
 13 Pet. purp.? converging. Grows in soil. Lvs. several, radical. *S. CRÁNICHIS*.
 13 Lip sack-shaped, 3-lobed, bearded. Sta. 1. Root bulbous. *c. CALYPSO*.
 13 Lip slipper-shaped, entire, beardless. Sta. 2. Rt. fibrous. *c. CYPRIPIEDÍUM*. 7

1. CORALLORHIZA. CORAL-ROOT. DRAGON'S-CLAW.

Flower ringent. Sepals and petals similar, ascending, the upper arching. Lip produced behind into a short spur, which grows closely to the ovary. Pollen masses 4, oblique.—Herbs without green leaves, with a much-branched, thick root, a scaly stem with a raceme of dull-colored flowers. *May—Sept.*

- 1 Spur imperceptible. Lip not lobed, sometimes with 2 teeth at base....2
 1 Spur manifest. Lip 3-lobed, side lbs. sm. Fls. purp. 10—20. *c. C. MULTIFLORA*.
 2 Fls. purp., 9—18, lip round., crisp-edged. Ova. and pod glob. *C. ODONTORHIZA*.
 2 Fls. purp., 3—10, lip oblong, notched at end. Ova. & pod oblo. *S. C. WISTARIANA*.
 2 Fls. yellow., 5—10, lip entire, oblong. Ovary and pod club-shaped. *C. INNATA*.

2. ARETHUSA.

Sepals and petals cohering at base, similar, ascending, arching. Lip spurless, deflexed at the end, bearded inside, cohering to the petal-like column at base. Anther terminal, closing the 2 pollen cells like a lid. Pollen-masses 2 in each cell.—Small plants, 1-flowered, in wet places. Lvs. none, or hidden in the sheaths.

A. BULBOSA. A beautiful plant 6'—12' high, invested with about 3 long loose sheaths with lanceolate points (hardly leaves). At the top is a large, fragrant purple flower, in June. *See the figure.*

3. ORCHIS.

Flower ringent, sepals and petals similar, all or all but two ascending and arching over the column. Lip turned downward, entire or lobed, produced at base into a spur beneath, which is distinct from the ovary. Stamen 1, anther 2-celled, pollen-masses 2, consisting of numerous waxy grains.—Flowers generally showy, in spikes or racemes. *June—Aug., mostly.*

- 1 Leaves radical and only 2 (rarely 3). Flowers on a scape....4
- 1 Leaf radical and only 1. Flowers small, on a scape....5
- 1 Leaves on the stem, several, upper ones reduced to bracts....2
- 2 Corolla lip entire, neither lobed, fringed nor toothed....6
- 2 Corolla lip 2- or 3-toothed, not fringed nor divided. Fls. greenish....7
- 2 Corolla lip cleft into a fringe at the edge, but not divided....8
- 2 Corolla lip divided into 3 parts which are fringed or not....3
- 3 Flowers white or yellowish, the 2 side petals 2-parted. *Southern*....9
- 3 Flowers white, the 2 side petals entire or toothed; lip clawed....10
- 3 Flowers purple, numerous, showy; lip raised on a claw....11
- 4 Fls. few, pink-purp., handsome. Lvs. oblong-ovate. Ht. 4'—7'. *O. SPECTABILIS*.
- 4 Fls. whitish, race. Spur very long. Lvs. round. Scape bracted. *O. ORBICULATA*.
- 4 Fls. green., spiked. Spur long as ova. Lvs. round. Scape naked. *O. HOOKERI*.
- 5 Lf. obovate, obtuse. Lip linear, entire. Scape 5'—8' high. *r. O. OBTUSATA*.
- 5 Lf. round. Lip 3-lobed, mid. lobe obcord. Hight 6'—9'. *r. O. ROTUNDIFOLIA*.
- 6 Flowers greenish. Lip, petals, leaves and bracts lanceolate. *O. HYPERBOREA*.
- 6 Fls. whitish. Lip lance-lin., rhombic at base. Bracts lance-linear. *O. DILATATA*.
- 6 Fls. white. Lip oblong-linear. Lvs. linear, bracts awl-shaped. *S. O. NIVEA*.
- 6 Fls. yellow, close. Lip ovate, crenate. Lvs. lance-oblong. *O. INTEGRIFOLIA*.
- 7 Lip 3-toothed at end. Spur longer than ovary. Bracts short. *O. TRIDENTATA*.
- 7 Lip 2—3-toothed at end, spur half as long. Bracts very long. *O. BRACTEATA*.
- 7 Lip obtuse, with a tooth each side, spur twice as long..... *O. FLAVA*.
- 8 Flowers yellow, small, lip slightly fringed, as long as the spur. *O. CRISTATA*.
- 8 Fls. yellow, large, lip deeply fringed, half as long as the spur. *O. CILIARIS*.
- 8 Fls. white, large, lip fringed; 2 side petals cut-toothed. *O. BLEPHARIGLOTTIS*.
- 9 Lvs. oval. Spur twice long as ovary. 5 bristle-form lobes. *O. QUINQUESETA*.
- 9 Lvs. lanceol. Spur shorter than ovary. 5 of lobes bristle-form. *O. REPENS*.
- 10 Pets. toth'd. Lip lobes fan-shaped, much fringed. Fls. white. *O. LEUCOPHAEA*.
- 10 Pets. entire. Lip lobes narrow, sparingly fringed. Fls. yellowish. *O. LACERA*.
- 11 Fls. dark-purp. Lip broad, lobes toothed, not fringed. *M.W.S. c. O. FISSA*.
- 11 Fls. light-purp. Lip wedge-shap., the 2 pets. merely toothed. *c. O. PSYCODES*.
- 11 Fls. light-purp. Lip semi-circl., large. 2 pets. fringed. *r. O. GRANDIFLORA*.

4. POGONIA. BEARD-FLOWER.

Flower with its sepals and petals distinct and somewhat spreading. Lip bearded inside, sometimes 3-lobed. Column club-shaped, wingless, anther terminal, pollen-masses 2, mealy.—Leaves 1—5, on the stem. Flowers purple. *June—Aug.*

- 1 Sepals linear, spreading, much longer than the petals....2
- 1 Sepals and petals nearly equal, similar, and nearly erect....3
- 2 Lvs. 5, in a whorl near the 1 brownish fl. Sepals 2' long. *r. P. VERTICILLATA*.
- 2 Lvs. 2, alternate, distant, lance-obl. Lip 3-lobed, crenulate. *S. P. DIVARICATA*.
- 3 Lvs. 2, distant, upper bract-like. Fl. termin.. pink-col'd. *P. OPHIGLOSSOIDES*.
- 3 Lvs. 3—4, alternate, with as many pink-white, drooping fls. *r. P. PENDULA*.



Fig. 254. *Pogonia verticillata*. Fig. 255. *Pogonia ophiglossoides*. Fig. 256. *Calopogon pulchellus*.

5. CALOPOGON. GRASS-PINK.

Flower with the sepals and petals similar, spreading, distinct. Lip on the upper side of the flower, stalked at base and bearded above. Column winged at the summit. Pollen-masses 2.—Leaf sheathing the base of the scape, which is bulbous at base. Flowers several.

CALOPOGON PULCHELLUS. A truly beautiful plant, common in moist meadows and in bogs. Scape slender, 1—2½ high. Leaf sword-shaped or broad linear, long. Flowers pink-purple, remarkable for having the lip on the upper side and the column below. July.

6. SPIRANTHES. LADIES' TRESSES.

Flowers in a spiral spike, somewhat ringent. Petals and sepals nearly erect, all tending to the upper side opposite the lip. Lip raised on a short claw, concave, entire, widened at top and furnished with 2 callous processes at base. Column arching, pollen-masses 2.—Stem leafy below or nearly naked, bearing a spike of small, white flowers, which are bent sideways and horizontal. *July—Oct.*

- 1 Fls. in a single row on one side, and but little twisted. Lvs. radical....2
- 1 Fls. in several rows all around the short spike. Lvs. on stem below....3
- 2 Lvs. ovate, varying to lance-oblong. Lip obovate, wavy-crisped. *S. GRACILIS.*
- 2 Lvs. lin., early withering (like first). Lip 3-lobed, finely crenate. *S. TORTILIS.*
- 3 Lvs. oblong-lance. 2'—4' long. Spike dense. Lip oblo., blunt, crisp. *S. LATIFOLIA.*
- 3 Lvs. lin.-lanceo., 3'—10' long. Spike dense. Lip oblo., round, crisp. *S. CERNUA.*
- 3 Lvs. lance., pointed, 3'—15'. Spike loose. Lip ovate, crisp-fring'd. *S. ODORATA.*

7. CYPRIPEDIUM. LADIES' SLIPPER.

The 2 lower sepals united into one piece or rarely distinct. Lip very large, inflated, sack- or slipper-form, obtuse. Column terminated by a petal-like lobe (which is the sterile stamen). Fertile stamens 2.—Root fibrous. Leaves large, plaited. Flowers large and showy, one or few. *May—July.*

- 1 Flowers yellow, one or more. Stems leafy....4
- 1 Flowers white or rose-purple....2
- 2 Stem leafy. Flower one or more....3
- 2 Scape naked, with 2 lvs. at the base, and 1 large flower at top. *c. C. ACAULE.*
- 3 Two lower sepals united. Fl. 1 only, smaller, white. *W.S. r. C. CANDIDUM.*
- 3 Two lower sepals united. Fls. few, very large, purplish. *c. C. SPECTABILE.*
- 3 Two lower sepals separate. Fl. 1 only, small, purplish. *r. C. ARIETINUM.*
- 4 Sepals narrow-lanceola. Lip flattened at sides, pale yellow. *c. C. PUBESCENS.*
- 4 Seps. ovate-lanceo. Lip flat above and below, bright yel. *c. C. PARVIFLORUM.*

ORDER 147. AMARYLLIDACEÆ.—AMARYLLIDS.

Perennial herbs with parallel-veined leaves, showy yellow or white flowers, with the 6 sepals colored alike (not woolly), with 6 stamens, with the ovary inferior, 3-celled, style 1, and stigma 3-lobed, with the fruit a 3-celled capsule or berry, and the seeds albuminous.

ANALYSIS OF THE GENERA.

- 1 Scapes or stems arising from a coated bulb....2
- 1 Scapes arising from a solid bulb or from fibrous roots....6
- 2 Perianth 6-parted, containing also a colored crown within....5
- 2 Perianth 6-parted, not furnished with a crown, mostly white....3
- 3 Flower 1, regular, nodding. Sepals not united into a tube....4
- 3 Fls. regular, rather erect, funnel-form, tube long, slender. S.†...C^RINUM.
- 3 Fls. irregular, nodding. Stamens declined, unequal. M.S.†...A^MARÝLLIS.
- 4 The 3 inner seps. smallest and notched at the end.† *Snow-drop*. G^ALÁNTHUS.
- 4 The 6 seps. similar, thickened at end. Fl. bell-shap.† *Snow-flake*. L^EUCÓJUM.
- 5 Crown undivided, bell-form, enclosing sta. Lvs. ensiform.† N^AR^CISSUS. 1
- 5 Crown (white) notched border bearing sta. Lvs. lin. &c. S.† P^AN^ERÁTIUM.
- 6 Fls. tubular-funnel-form, many. Lvs. thick, radical. *False Aloe*. S.† A^GÁVE.
- 6 Fls. star-shaped, spread., yel., few. Lvs. grass-like. *Star-grass*. c. H^YPÓXIS.

1. NARCIS'SUS. JONQUIL. DAFFODIL.

Perianth regular, crown of one piece, funnel-form or bell-form, consisting of a whorl of sterile petal-like filaments united by their edges, within which the fertile stamens are inserted.—A beautiful genus of bulbous plants with sword-shaped leaves and yellow or white flowers. None here native.† *Apr.—June*.

1 Scape bearing 1—3 large flowers....2

- 1 Sc. many-f'rd., sep. white, crown yellow, short. *Polyanthus*. N. TAZÉTTA.
- 2 Scape 2-edged. Seps. whitish. Crown yellow, long and large. N. DÁFFODIL.
- 2 Scape terete. Crown yellow, much shorter than the yel. seps. N. JONQUÍLLA.
- 2 Sc. terete. Crown variegated, rotate, short; sep. mostly white. N. PÓÉTICUS.

ORDER 149. IRIDACEÆ.—IRIDS.

Perennial *herbs*, arising from bulbs or thickened roots, leaves 2-rowed, flowers perfect, regular or irregular, spathaceous, perianth of 6 petal-like segments, stamens 3, anthers turned outwards, ovary inferior, 3-celled, with 1 style and 3 stigmas, becoming in fruit a 3-celled capsule with many albuminous seeds.

ANALYSIS OF THE GENERA.

- 1 Flowers regular, 3 petals unequal to the 3 sepals....2
- 1 Flowers regular, petals and sepals alike....3
- 1 Fls. irregular, stamens ascending. Sds. winged. *Corn Flag*. † GLADIOLUS.
- 2 Stamens separate. Stigmas petal-like. Petals erect. Sep. reflexed. *Iris*. 1
- 2 Stamens united. Seps. very large. Pets. spreading. † *Tiger Flower*. TIGRIDEA.
- 3 Fls. blue, small, rotate. Lvs. &c. grass-like. *Blue-eyed-grass*. SYRINCHIUM.
- 3 Fls. purp., white or yellow, tube very long, sessile on the bulb. † CRŒCUS.
- 3 Fls. yellow, red-spotted, tube short. Hight 3—5f. † *Ixia*... PARDANTHEUS.

I. IRIS. FLOWER-DE-LUCE.

Perianth 6-parted, the 3 outer divisions (sepals) reflexed, or spreading, the 3 inner (petals) erect. Stamens 3, distinct. Style short. Stigmas 3, petal-like, covering the stamens.—Perennial herbs with thick roots or root-stocks, sword-shaped or grass-like leaves and large showy flowers. *Apr.—July.*

- 1 Stems leafy, tall (1—2f high), mostly bearing several flowers....2
- 1 Scapes leafless, low (1'—6' high), mostly bearing but 1 flower....4
- 2 Sepals or perianth bearded. Cultivated exotics in gardens, &c....9
- 2 Sepals and petals beardless. Wild plants, hardly ever cultivated....3
- 3 Leaves linear, grass-like, less than half an inch wide....5
- 3 Leaves sword-shaped, nearly 1' or 2' wide....6
- 4 Sepals or perianth bearded, beard crested or not crested....8
- 4 Sepals and petals beardless, but sometimes with a crest....7
- 5 Stem hollow. Ova. & pod obtuse, sides flat. Fls. light blue. *S. I. SIBERICA.*
- 5 St. slend. Ova. and pod acute, sides 2-groov. Fls. yel.-blue. *E. I. PRISMÁTICA.*
- 6 St. 1-angled. Fls. blue-yell.-whit. Pet. obtu., large. *c. Blue Flag*. *I. VERSICOLOR.*
- 6 St. terete. Fls. blue. Petals very small, 3-toothed at the end. *S. I. TRIPÉTALA.*
- 6 Stem terete. Fls. orange-yell. Sepals and pet. notched at end. *S. I. CŒPREA.*
- 7 Scape 1-flowered, fl. blue and yellow. Lvs. lanceolate. *r. W. I. LACUSTRIS.*
- 7 Scape 1-flowered, fl. blue. Lvs. linear, very long. Pod round. *S. I. VÉRNA.*
- 7 Sc. 3-flowered, fls. yell. Lvs. sword-shaped. Pod 6-angled. † *I. OCHROLEUCÁ.*
- 8 Sc. 1-fl'd, 2'—4' high, fl. blue and yellow. Lvs. lance. 3' long. *S. I. CRISTATA.*
- 8 Sc. 1-fl'd, 6'—10' high, fl. deep blue. Pet. obtuse. Lvs. ensiform. † *I. PÚMILA.*
- 8 Scape many-fl'd, flattened. Fls. pale blue. Stigmas jagged. † *I. CHINÉNSIS.*
- 9 Stem many-fl'd, fls. blue or whitish. Pet. and sep. notched. † *I. SAMBUCINA.*
- 9 Stem many-fl'w'd, fls. deep blue, spathes also colored. † *r. I. GERMÁNICA.*
- 9 Stem 1-fl'd, fl. striped. Petals deflexed. *Chalcedonian Iris*. †... *I. SUBIANA.*

ORDER 152. TRILLIACEÆ.—TRILLIADS.

Herbs with tuberous roots, simple stems, and whorled, net-veined *leaves*, with the *flowers* one or few, terminal and mostly 3-parted, with the *sepals* green, and the *petals* more or less colored, with the *stamens* 6—10, awl-shaped filaments and linear anthers, with the *ovary* free, 3—5-celled, becoming in fruit a juicy, many-seeded pod.

ANALYSIS OF THE GENERA.

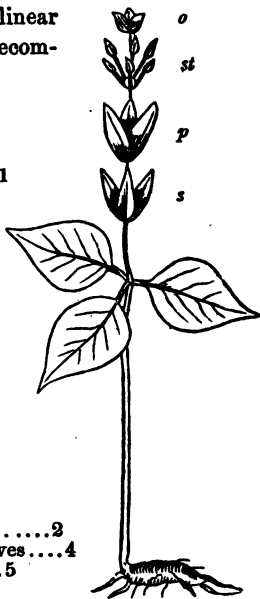
- Plants with 1 whorl of leaves and
1 flower. Pod many-seeded... *TRILLIUM*. 1
Plant with 2 whorls of leaves and
several greenish fls... *MEDŒLA Virginica*.

Fig. 257. *Trillium erythrocarpum*, with the parts of its flower separated. *s*, the 3 sepals; *p*, the 3 petals; *st*, the 6 stamens; *o*, the 3 carpels.

1. TRILLIUM. WAKE ROBIN.

Character as expressed in the Order above.—4 Low herbs with a simple stem, bearing at top a whorl of 3 leaves and a single large flower. *April—June*.

- 1 Flower sessile, petals dark purple....3
- 1 Fl. on a peduncle, raised above the leaves.....2
- 1 Fl. on a peduncle recurved beneath the leaves....4
- 2 Lvs. sessile, rhomboidal or rhomboid-ovate....5
- 2 Leaves petiolate, rounded at the base....6
- 3 Lvs. sessile. Sep. erect, $\frac{2}{3}$ as long as linear lanceolate petals. *T. SÉSSILE*.
- 3 Lvs. petiolate. Sep. recurved, long as lance-ovate petals. *T. RECURVATUM*.
- 4 Lvs. round-rhomboidal, pointed. Pets. white, pointed, recurv.. *T. CŒRNUM*.
- 4 Lvs. lance-elliptic, acute. Pets. rose-white, obtuse, straight. *S. T. STYLÖSUM*.
- 5 Petals ovate, dark purple (or white), ill-scented, flat. *T. ERĒCTUM*.
- 5 Pets. obova., rose-white, recurv., twice larger than sep. *T. GRANDIFLÖRUM*.
- 5 Petals obovate, rose-white, obtuse, flat, as large as sepals. ... *T. OBOVATUM*.
- 6 Stem 2'—4' high. Lvs. obtuse. Petals obtuse, wavy, snow-white. *T. NIVALE*.
- 6 Stem 8'—12'. Lvs. & pets. pointed, wavy, purp.-white. *T. ERYTHROCÄRPUM*.



ORDER 153. LILIACEÆ.—LILYWORTS.

Herbs with parallel-veined leaves, bulbous or tuberous stems, flowers perfect, regular, generally large and richly colored, perianth 6 (rarely 4)-parted, uniformly colored, free from the ovary, stamens 6 (rarely 4), anthers fixed by a point and turned inwards, style single, ovary superior, 2- or 3-celled, seed with fleshy albumen.

ANALYSIS OF THE GENERA.

- 1 Plants arising from a coated or scaly bulb....2
- 1 Plants arising from a root-stock or fibrous roots....5
- 2 Scapes bearing the flowers and sheathed at base by the leaves....3
- 2 Stem bearing above the base both leaves and flowers....8
- 3 Sepals and petals united below into a tube....11
- 3 Sepals and petals separate, not forming a tube....4
- 4 Flower 1 only, the perianth bell-shaped....7
- 4 Flowers few or many, star-shaped, umbeled or corymbed....9
- 4 Flowers many, star-shaped, racemed or paniced....10
- 5 Sepals united into a tube to near the top. Flowers small....14
- 5 Sepals united into a tube less than half-way up. Flowers large....15
- 5 Sepals and petals separate, or not united into a tube....6
- 6 Stems (leafy) dividing into leafy branches....12
- 6 Stems or scapes not branched, or with leafless branches....13
- 7 Flower nodding. Leaves 2, usually spotted with brown.. ERYTHRONIUM. 1
- 7 Flower erect. Leaves 1 or more, thick, glaucous. Tulip.†... TULIPA.
- 8 Sepals each with a grooved line lengthwise within. Lily..... LILIUM. 2
- 8 Sep. each with a honey cavity at base within. Crown-imperial. FRITILLARIA.
- 9 Flowers in a close umbel with a 2-leaved spathe. Garlic, &c... ALLIUM. 3
- 9 Flowers in a loose corymb, white.† Star-of-Bethlehem... ORNITHOGALUM.
- 9 Fls. 2 or 3, large, white, woolly within, smooth at base. S. CALOCHORTUS.
- 10 Style thread-like. Ovary cells several-seeded. Fls. blue. W. S.... SCILLA.
- 10 Style very short. Ovary cells 1-seeded. Fls. white. Ht. 2—3f. S. NOLINA.
- 11 Fls. white, large, fragrant. Sta. on top of tube. Tuberoze.† POLIANTHES.
- 11 Fls. blue, smallish. Stamens on middle of tube. Hyacinth. HYACINTHUS.

- 12 Lvs. thread-form, short, fascicled. Berries red. Ht. 3—4f.†. *ASPÁRAGUS*.
 12 Lvs. ovate, &c. Seps. rose-white, recurv. at end. *Twist-foot*. c. *STRÉPTOPUS*.
 12 Leaves ovate, &c. Sepals straw-color, straight or twisted. c. *UVULÀRIA*. 4
 13 Fls. white or yell. Lvs. lance-oval, &c. Ber. glob. *Solm's-seal*. *SMILACINA*. 5
 13 Fls. green-whit., many. Lvs. thick, ensiform, &c. Pod 3-cornered. *S.YUCCA*.
 13 Fls. yellow, star-shaped. Lvs. narrow. Fr. a pod. *Asphodel*. *ASPHÓDELUS*.
 14 Fls. greenish, axilla. St. leafy, recurved. c. *Solomon's-seal*. *POLYGONATUM*.
 14 Fls. white, racem. on scape. Lvs. radical. *Lily-of-the-valley*. *CONVALLÀRIA*. 6
 15 Fls. tawny or yel. Lvs. long, lance-lin. *Yellow Day Lily*.† *HEMEROCALLIS*.
 15 Fls. blue or whit. Lvs. cordate or ova.† *Blue & White Day Lily*. *FÚNKIA*.

1. ERYTHRONIUM. Dog-tooth Violet.

Perianth bell-form, ^a sepals recurved, the 3 inner ones usually with a callous tooth each side near the base, and a groove in the middle. Pod a little stalked. Seeds egg-shaped. — Stem a bulb deep in the ground. Scape bearing a single flower, its base sheathed by the base of the two smooth leaves. *Apr.—May.*

Fig. 258. The Dog-tooth Violet. (*E. Americanum*.) 1, the bulb. 3, The flower spread open, showing the 2 teeth in each petal, also the position of all the parts. 4, The ovary, style and stigma. 5, A cross-section of the ovary. 6, The plan of the flower. a, the 3 sepals in the outer circle; b, the 3 petals next; c, the 6 stamens and d, the 3-celled ovary.



Flower yellow. Scape without a bract. Petals toothed. *c.*... *E. AMERICANUM*.
 Fl. greenish-yel. Scape bearing a bract. Lvs. very unequal. *r.* *E. BRACKETUM*.
 Flower white. Scape without a bract. Petals not toothed. *W. r.*... *E. ALBIDUM*.

2. LILIUM. LILY.

Perianth bell-shaped, segments mostly recurved, each with a groove running lengthwise within from the middle to the base. Stamens shorter than the style. Valves of the pod connected by latticed hairs.—Herbs with bulbous and leafy stems. Leaves whorled or scattered, sessile. Flowers terminal. *June—July*.

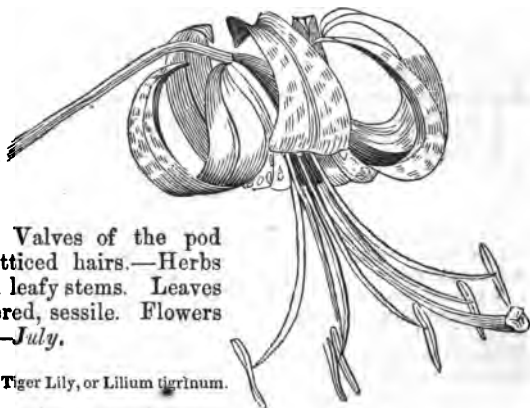


Fig. 259. A flower of the Tiger Lily, or *Lilium tigrinum*.

- 1 Plants bearing bulblets in the axils. Flowers orange. Gardens....6
- 1 Plants not bulbiferous in the axils of the leaves....2
- 2 Flowers erect, orange-red. Sepals raised on claws....5
- 2 Flowers nodding, white. Sepals sessile. Gardens....7
- 2 Flowers nodding, yellow or orange. Sepals sessile. Wild plants....3
- 3 Sepals orange-red, strongly revolute, almost into rings....4
- 3 Seps. yellow, merely recurved, spreading above middle. *c.* *L. CANADENSE*.
- 4 Fls. 3—30, very showy. Lvs. lanceol., lower whorled. *c. M. W. S. L. SUPERBUM*.
- 4 Fl. generally but 1. Lvs. wedge-lanceolate, partly whorled. *S. L. CAROLINUM*.
- 5 Upper lvs. in whorls. Flowers 1—3, purple-spotted. *c. L. PHILADÉLPHICUM*.
- 5 Leaves all scattered. Flower 1, red- and yellow-spotted. *S. L. CATESBEI*.
- 6 Fls. erect, rough within, bell-shap. Lvs. 3-veined, scattered.† *L. BULBIFERUM*.
- 6 Fls. nodding. Seps. strongly revolute. Lvs. 3-veined, scattered.† *L. TIGRINUM*.
- 7 Fls. in a raceme, smooth, large. Lvs. scattered.† *White Lily. L. CANDIDUM*.
- 7 Fl. 1 only, very large. Sepals reflexed at end.† *Japan Lily. L. JAPONICUM*.

3. ALLIUM. GARLICK, ONION, &c.

Flowers in a dense umbel with a 2-leaved spathe. Perianth deeply 6-parted, colored, usually spreading, persistent. Stamens 6.

Ovary angular. Style thread-like. Pod 3-lobed, containing 1 or 2 black seeds in each cell.—Strong-scented, bulbous, stemless herbs, the leaves radical and the umbel on a scape, sometimes bearing bulblets instead of flowers. *May—July.*

- 1 Plants growing only by cultivation in gardens, &c....4
- 1 Plants growing wild, in woods, meadows, &c....2
- 2 Scares bearing bulbs in the umbel with the rose-colored flowers....5
- 2 Scares bearing only flowers in the umbel....3
- 3 Leaves lance-oblong, sometimes perishing before flowering....6
- 3 Leaves linear, flat or very nearly flat. Flowers rose-colored....7
- 3 Leaves linear, channeled above and angled beneath....8
- 4 Filaments 3-cleft. Leaves flat, linear, sheathing at base....9
- 4 Filaments all simple. Leaves terete and tubular, large or slender....10
- 5 Filaments broad, 3 inner ones 3-cleft. Leaves terete, tubular..A. *VINEALE*.
- 5 Filaments all simple. Lvs. linear, flattish. Scape terete. A. *CANADENSIS*.
- 6 Lvs. perish before flowering. Umb. erect, with many white fls. A. *TRIGLOCCUM*.
- 6 Lvs. accompanying the few flowers, longer than the scapes. *r.* A. *TRIFLORUM*.
- 7 Umbel loose-fl'd, nodding. Scape angular. Lvs. very long. A. *CERNUUM*.
- 7 Umbel many-flowered, erect. Scape terete. Pod 3-seeded. S. A. *MUTABILE*.
- 8 Leaf 1 only. Flowers numerous, in a level-topped umbel. S. A. *STELLATUM*.
- 8 Leaves many, streaked on the back. Scape 3-angled. S. A. *STRILATUM*.
- 8 Leaves many. Umbel level-topped. Scape 2-edged. S. A. *ANGULOSUM*.
- 9 Scape leafy below. Lvs. flat. Umbel bulb-bearing.† *Garlic*. A. *SATIVUM*.
- 9 Scape leafy below. Lvs. flat. Umbel with flowers only.† *Leek*. A. *PORRUM*.
- 10 Leaves rush-like, slender, as long as the scapes.† *Chives*. A. *SCHENOPRISUM*.
- 10 Lvs. large, thick. Scape tall, hollow, swollen below.† *Onion*. A. *CÆPIUM*.

4. UVULARIA. BELLWORT.

Perianth 6-parted. Sepals linear-spatulate or lanceolate, with a honey cavity at the base of each. Filaments very short, anthers half as long as the sepals. Style 3-cleft. Pod (or berry) 3-celled, cells few-seeded.—Root-stock creeping. Stem leafy and usually branched. Flowers mostly solitary, straw-yellow, pendulous. *May.*

- 1 Leaves perfoliate (§ 220). Pod obovate, 3-lobed at end....3
- 1 Leaves sessile. Sepals cream-colored, obtusish, ovate, 3-angled....2
- 1 Lvs. sessile. Sepals greenish, acuminate. Berry red. *M.S.* U. *LANUGINOSA*.
- 2 Lvs. glabrous, glauc. beneath. Pod raised on a little stalk. *c.* U. *SESSILIFOLIA*.
- 2 Lvs. fine-downy, shining green both sides. Pod sessile. *M.S.* U. *PUBERULA*.
- 3 Seps. smooth within and without, 1½ long. Anths. obtuse. U. *GRANDIFLORA*.
- 3 Seps. granular-rough. within, scarce 1' long. Anth. pointed. U. *PERFOLLATA*.

5. SMILACINA.

SOLOMON'S-SEAL. (CONVALLARIA.)

Perianth 4- or 6-parted. Sepals spreading more or less. Stamens 4 or 6, divergent, arising from the base of the sepals. Berry globular or ovoid, 2- or 3-celled, few- or many-seeded.—Plants somewhat various in habit, with simple stems, alternate or radical leaves, and racemes or umbels of flowers. *May—June.*

Fig. 260. *Smilacina borealis*. 2, A berry cut open, showing the 2-cells, &c.



- 1 Stem leafy. Flowers star-shaped, white, racemed. Berries speckled....2
 1 Scape leafless. Flowers bell-shaped, in umbels. Berries blue....4
 2 Perianth 6-parted. Stamens 6. Leaves never cordate....3
 2 Perianth 4-parted. Stamens 4. Lvs. mostly 2, cordate. Dwarf. c. *S. BIFOLIA*.
 3 Lvs. mostly 3, tapering at both ends. Raceme simple. Low. r. *S. TRIFOLIA*.
 3 Lvs. 8—10, lanceolate, clasping, 3-veined. Raceme simple. *S. STELLATA*.
 3 Lvs. many, lance-oval, short-stalked. Raceme compound. c. *S. RACEMOSA*.
 4 Umbel 3—7-flowered. Fls. yellowish. Berry many-seeded. c. *S. BOREALIS*.
 4 Umbel 12—30-flowered. Fls. whitish, spotted. Ber. 4-seed. r. *S. UMBELLULATA*.

ORDER 155. MELANTHACEÆ.—MELANTHS.

Perennial *herbs*, sometimes bulbous, often poisonous, with the *leaves* parallel-veined, *perianth* regular, double, 6 parted, *sepals* all of one color, with 6 stamens and 3 distinct styles,

ovary free from the calyx, becoming in fruit a 3-celled pod,
seeds few or many, with a membranous coat and fleshy albumen:

ANALYSIS OF THE GENERA.

- 1 Stem (leafy) bearing a panicle of racemes....2
- 1 Stem or scape bearing a simple raceme or spike....3
- 2 Flowers ♂ ♀ on the same plant. Lvs. oval, or lanceolate, or linear....4
- 2 Flowers all perfect (♀). Leaves linear and grass-like....5
- 3 Leaves linear or rush-like, both radical and cauline....6
- 3 Leaves lanceolate or oval. Pod many-seeded....7
- 3 Leaves linear and grass-like, all of them radical....8
- 4 Sepals destitute of glands and free from the stamens.....VERATRUM. 1
- 4 Sepals bearing each 2 glands and a stamen on its claw.....MELANTHIUM.
- 5 Flowers greenish-white. Sepals each with 2 glands at base. ZIGADENUS.
- 5 Fls. pure white, showy. Sepals destitute of glands. M.S. } AMIANTHIUM.
- 6 Lvs. grass-like, few on stem. Fls. numer., whit. Fly-poison. }
- 6 Lvs. rush-like, numerous, dry. Flowers white, showy. M.S. XEROPHYLLUM.
- 6 Lvs. sedge-like, very narrow, dry. Flowers greenish, dry. S.....PLEEA.
- 7 Flowers perfect (♀), greenish-white. Lvs. all radical. M.S.. HELONIAS.
- 7 Fls. diœcious (♂ ♀), yellow.-white. St. leafy. (Helonias.) CHAMÆLIRIUM.
- 8 Fls. minute, green. Spike very slender. Anths. 1-celled. S. SCÆNOCAULON.
- 8 Fls. small, colored, spiked or racemed. Anthers 2-celled. W...TOPIDIA.

1. VERATRUM. POKE. FALSE HELLEBORE.

Flowers polygamous by abortion in the same plant. Sepals united at base, colored, spreading, sessile and without glands. Stamens 6, shorter than the sepals, wanting in some of the flowers. Ovaries 3, united at base, often abortive. Pod 3-partible, many-seeded.—Stems leafy more or less. Flowers paniced. *June—July.*

- 1 Leaves oval or lanceolate. Sepals obovate-oblong....2
- 1 Leaves linear, grass-like. Sepals lance-linear, pointed. V. ANGUSTIFOLIUM.
- 2 Leaves oval, large. Stem very leafy, thick. Fls. greenish. c.... V. VIRIDE.
- 2 Lvs. lanceolate, &c. Stem few-leaved, tall. Fls. black-purp. W. V. WOOLII.

INDEX AND GLOSSARY :

CONTAINING DEFINITIONS OF BOTANICAL TERMS, TOGETHER WITH REFERENCES TO THOSE PARAGRAPHS IN WHICH THEY ARE DEFINED IN THE FOREGOING LESSONS.

A (in composition) signifies without ;
as, apetalous, destitute of petals.

Abortive, imperfect, useless.

Abbreviations, page 12.

Acaulescent, 81.

A'cerose, needle-shaped, 179.

Achénium, 378.

Acicular, needle, or bristle-shaped.

Acrogens, 423.

Aculeate, armed with prickles.

Acuminate, pointed, 194.

Acute, sharp-angled, 192.

Adherent, 273.

A'dnate, growing to or upon, 225.

Æstivation, 345.

Aggregate, assembled close together.

Agumacea, 422.

Ala, wings. *Alate*, winged.

Albumum, 125.

Albumen, Albuminous, 392.

Alternate, 74, 141.

A'loveolate, honey-comb-like ; as the
receptacle of some Asterworts.

Ament, 247. *Amentaceous*, 247.

Amplexicaul, stem-clasping, 152, 219.

Analysis, 443.

Ancipital, two-edged.

Angiosperms, 420.

Angiospermous, seeds in a vessel, 420.

Annual, yearly, 48, 57.

Anther, 301.

Apetala, 421.

Apetalous, without petals.

Appendage, some unusual part added.
Appressed, pressed closely upon something else.

Aqualic, growing in water.

Arborescent, tree-like.

Arid, dry.

Aristate, bearded, as the glumes of
barley.

Armed, 109.

Aromatic, strong-scented, spicy.

Articulation, a joint ; the place where
one thing is joined to another.

Artificial Classes, 304, 410.

Artificial Orders, 323.

Ascending, arising obliquely, assurg-
gent.

Assurgent, arising in an oblique direc-
tion.

Attenuate, made slender, or thin.

Auriculate, or *Auricled*, 191, 10.

Awn, 230, 231.

Axil, arm-pit, 68.

A'xillary, growing out of the axils, 67.

Axis, the stem, or centre of a thing,
around which the parts are ar-
ranged, 78.

Baccate, berry-like, covered with pulp.

Banner, 292.

Bark, 128.

Beak, a hard, short point, like that of
a bird.

Bearded, with long, stiff bristles, or
hairs.

Bell-shaped, 281.
Berry, 384.
Bi (in composition), twice; as in
Bicuspidate, with two points.
Bidentate, with two teeth.
Biennial, of two years' duration.
Bifid, two-cleft.
Bifoliate, two-leaved.
Bifurcate, two-forked.
Bilabiate, two-lipped.
Binate, two growing together.
Bipinnate, twice-pinnate, 213.
Bipinnatifid, twice-pinnate-cleft.
Disaccate, with two tumors, or sacks.
Biterminal, twice ternate, 216.
Bivalved, two-valved.
Botany defined, 4.
Bracteat, or *Bracted*, having bracts.
Bracteoles, or *Bractlets*, little bracts.
Bracts, 227.
Branch, 70.
Branchlets, small branches.
Bristles, stiff hairs.
Bud, 64.
Bulb, 83. *Bulbous*, having bulbs.
Bulblets, little bulbs borne above the
 ground, 85.
Caducous, falling off very early.
Calyxine, of the calyx.
Calyculate, having bractlets resem-
 bling an outer additional calyx.
Calyx, 271.
Campanulate, bell-shaped, 281.
Canescent, whitish with fine hairs.
Capillary, very slender, hair-like.
Capitate, head-shaped, globular.
Capsule, a pod, 367.
Carinate, keel-shaped.
Caryopsis, a grain, or kernel, 377.
Carpels, 317.
Cartilaginous, gristly.
Caryophyllaceous, 291.
Catkin, ament, 247.
Caudate, with a tail.

Caudex, 33.
Cauliscent, 93.
Cauline, 146.
Caulis, 93.
Cellular, composed of cells.
Cellular tissue, 119.
Cernuous, nodding.
Chaffy, with chaff.
Character, marks which distinguish a
 species, genus, &c.
Chartaceous, of the texture of writing
 paper.
Cilia, hairs like those of the eye-
 lashes.
Ciliate, 18.
Circinate, 354.
Circumscissile, opening like a lid.
Cirrrose, 210.
Clavate, club-shaped.
Claw, *Clawed*, 278.
Climbers, 99, 102.
Cochleate, resembling the shell of a
 snail.
Cohering, connected.
Collective fruit, 385.
Colored, not green.
Column, the consolidated stamens and
 pistils of the Orchids.
Coma, a tuft of hairs.
Compound flowers, 253.
Compound leaves, 154, 206.
Compressed, flattened lengthwise.
Cone, the same as strobile, 396.
Confluent, joining together.
Conjugate, joined in pairs.
Connate, joined together at the base.
Connivent, converging together.
Contorted, twisted, 349.
Convex, rising spherically.
Convolute, 348.
Cordate, heart-shaped, 171, 178.
Coriaceous, leathery, thick and tough.
Corm, 86.
Cornute, *Corniculate*, horned.

- Corolla*, 276.
Corôna, or *Crown*, the expanded, cup-like disk of *Narcissus*, &c.
Corymb, 249.
Corymbose, arranged like a corymb.
Costate, ribbed.
Cotyledon, 394.
Creeper, 90.
Crenate, and *Crenulate*, 184.
Crisped, 190.
Cristate, or *Crested*, with a raised ridge.
Cruciform, 288.
Cryplogamia, 22, 398, 417.
Cucullate, hood-shaped, cowled.
Culm, 95.
Cuneate, wedge-shaped.
Cupule, the cup of the acorn, &c.
Cuspidate, with a small, abrupt point.
Cuticle, the epidermis, scarf-skin.
Cyme, 258. *Cymose*, like a cyme.
Decandrous, with 10 stamens.
Deciduous, 232.
Declinate, turned aside, or downward.
Decomound, more than once compounded; as, bipinnate, &c.
Decumbent, lying upon the ground, but rising toward the apex.
Decurrent, 221.
Decussate, crossing at right angles.
Deflexed, bent downward.
Dehiscence, 369.
Deltate, or *Deltoid*, 169, 4.
Dentate, and *Denticulate*, 182.
Depressed, flattened from above.
Di (in composition), two; as in
Diadelphous, stamens united in two sets.
Diândrous, with two stamens.
Dichotomous, branched by two equal divisions; forked.
Didynamous, having 2 long stamens and 2 short ones, in the flower.
Diffuse, spreading widely, or loosely.
Digitate, 173.
Diœious, bearing staminate flowers on one plant, and pistillate on another, 312, 22.
Discoid, 255.
Disk, 253, 297.
Dissected, cut into 2 parts.
Dissepiment, the partitions in a pod, &c., separating the cells.
Distinct, not united with each other.
Divaricate, spreading in a straggling manner.
Dodecândrous, with 12 stamens.
Dorsal, on the back.
Downy, clothed with soft hairs.
Drupe, 373.
Durâmen, 126.
E, or *Ex* (in composition), destitute of.
Echinate, beset with prickles.
Elliptical, 168: 2.
Elongated, exceeding the common length.
Emarginate, 145.
Embryo, 390.
Endogens, *Endogenous*, 113, 132, 418.
Enneandrous, with 9 stamens.
Ensiform, sword-shaped, two-edged.
Entire, even-edged, 181.
Ephemeral, lasting but a day.
Epidermis, the skin, 9.
Epigynous, standing on the ovary.
Epiphytes, plants growing on other plants.
Equitant, 353.
Erose, 185. *Esulent*, eatable.
Exogens, 111, &c., 418.
Exotic, foreign, not native.
Exserted, projecting out of, beyond the orifice.
Exsiccate, dried up.
Exstipulate, 226.
Extrorse (anthers), facing outward.
Falcate, sickle-shaped, linear and curved.

- Family*, 426.
Fascicle, 259.
Fasciculated, 41, 144.
Fastigiate, having a flat or level top.
Feather-veined, 166.
Fertile, fruit-bearing, 264.
Ferruginous, iron-colored, rust-colored.
Fibrils, 34.
Fibrous, 38.
Filament, 300.
Filiform, thread-shaped.
Fimbriate, bordered with a fringe.
Fistulous, or *Fistular*, tubular, hollow.
Flexuous, bent in a wavy manner.
Florals, the flowers in a compound flower are sometimes so called, 253.
Flower, 261, &c.
Flower-bud, 64.
Flowering Plants, 21, &c.
Flowerless Plants, 21, &c.
Foliaceous, having the texture of leaves.
Follicle, 362.
Foot-stalks, the stalks of either flowers or leaves.
Fork-veined, 164.
Free, not adhering, 273.
Free central placenta, 327.
Fringed, the same as fimbriate.
Fruit, 355.
Fruitescent, shrubby, or woody.
Frugacious, 232.
Funiculus, the seed-stalk.
Funnel-shaped, 282.
Furcate, forked.
Fusiform, spindle-shaped, 42.
Galea, the arched upper lip of a labiate corolla (285).
Geminate, in pairs.
Genus and Genera, 27.
Germ, the early name of the ovary.
Germination, 396.
Gibbous, swelled out, protuberant.
Glabrous, smooth, 13, 197.
Glands, the organs of secretion, or little bodies or swellings in the leaves or flowers, 12.
Glandular, gland-bearing.
Glaucous, sea-green; pale, bluish green, with a powder, or bloom.
Globöse, *Globular*, round, or spherical.
Glomerate, crowded together.
Glumaceæ, 422.
Glume, 230.
Granular, formed of, or covered with grains.
Grooved, furrowed, or channeled.
Gymnosperms, 420.
Gynandrous, having stamens and pistils combined into one body, 311: 20.
Hairs, 12.
Hastate, or *Halbert-shaped*, 171: 11.
Habit, the general appearance of a plant.
Habitat, the place where a plant grows.
Head, 252, 253.
Heart-shaped, 171, 178.
Heart-wood, 126.
Helmet, the same as galea (285).
Heptandrous, with 7 stamens, 308: 7.
Herb, 62. *Herbaceous*, herb-like.
Herbarium, 466, &c.
Hexandrous, having 6 stamens, 308: 6.
Hirsute, 15.
Hispid, rough, with stiff hairs.
Hoary, 201.
Hooded, curved or rolled into the form of a hood.
Hybrid, partaking the nature of two species.
Hypocrateriform, 283.
Hypogynous (309: 13), inserted under the ovary.
Imbricated, placed one over another, like the tiles upon a roof, 350.
Incised, 188.

Indefinite, variable in number, and too many to be readily counted.

Indehiscent, not opening, 369.

Indigenous, native of.

Inferior, 273.

Inflated, tumid, as if filled by wind.

Inflexed, bending inward.

Inflorescence, 236.

Infundibuliform, 282.

Inserted into, growing out of.

Internode, 71.

Involucel, the involucre of an umbellet is so called.

Involucrate, surrounded by an

Involucré, 228.

Irregular flower, 338.

Keel (carina), 292. [a boat.

Keeled, ridged and curved beneath like

Kidney-shaped (reniform), 171.

Labiate, 285.

Laciniale, 173, 189.

Lactescent, milky, or juicy.

Lamina (blade), 147, 278.

Lanceolate, 169 : 6.

Lateral, on the side.

Leaf, 136, &c.

Leaf-bud, 64.

Leaflets, 207.

Legume, 363.

Leguminous, bearing legumes.

Lenticular, shaped like a double-con-

vex lens.

Liber, 128.

Ligneous, woody.

Ligulate, strap-shaped, 287.

Liliaceous, 290.

Limb, 279.

Line, the twelfth part of an inch.

Linear, 176.

Linnæan Classes, 304, 410.

Linnæan Orders, 323.

Linnæus, 305, 410.

Lobate, or *Lobed*, 173.

Loment, a jointed legume.

Lunate, crescent-shaped.

Lyrate, 172.

Marginal, on the margin.

Medulla, the pith.

Médullary rays, 118, 120.

Membranous or *Membranaceous*, thin and soft, like a membrane.

Midvein, 158.

Monadelphous, stamens all united into one set, 311 : 15.

Monandrous, with one stamen, 308 : 1.

Moniliiform, neck-lace form, or resembling a string of beads.

Monæcious, stamens and pistils apart, in separate flowers, on the same plant, 312 : 21.

Monopetalæ, 421.

Monopetalous, 279.

Mucronate, 196.

Multifid, many-cleft.

Muricate, with hard, short points.

Naked, a relative term, signifying destitute of, or without.

Naked seeds, 358.

Napiform, 44.

Natant, swimming.

Natural System, 413, &c.

Natural Orders, 426, &c.

Nectariferous, producing honey.

Nectary, 293.

Net-veined, 162.

Neutral flowers, 264.

Nodding, in a drooping posture.

Node, 71. *Nodose*, knotted.

Nomenclature, 473.

Normal, regular, according to rule.

Nut, 375. *Nutlet*, a little nut.

Ob (in composition), implies inversion.

Oblong, 168.

Oblique, unequal, one-sided.

Obovate, 170 : 7.

Obsolete, indistinct, as if worn out.

Obtuse, blunt, 193.

- Ochrea*, 225.
Offset, a short, thick runner.
Opposite, 75, 142.
Orbicular, 168.
Orders, 426.
Ordinal, relating to the orders.
Oval, 168 : 2.
Ovary, 316, &c.
Ovale, egg-shaped as to surface, 169 : 5.
Ovoid, egg-shaped as to a solid.
Ovules, 325.
Palea, the inner chaff, or grasses.
Palmate, 173.
Palmate-veined, see radiate-veined, 167.
Palmately trifoliate, 212.
Panduriform, fiddle-shaped.
Panicle, 256.
Papilionaceous, 292.
Pápillose, with small gland-like processes.
Pappus, 275.
Parasite, *Parasitic*, 46.
Parallel-veined, 163.
Parietal, of, or adjoining the wall ; as,
Parietal placenta, 328.
Pectinate, comb-like, with long, narrow segments.
Pedate, foot-shaped, 173 : 21.
Pedicel, 241.
Pedicellate, furnished with a pedicel.
Peduncle, 240.
Pellucid, transparent.
Peltate, 173.
Pendulous, drooping, hanging down.
Pentandrous, with 5 stamens. 308 : 5.
Pepo, 383.
Perennial, enduring three years or more.
Perfoliate, 220.
Pericarp, 360.
Perigynous, inserted into the calyx, 309 : 12.
Persistent, permanent, not falling off.
Personate, 285.
Pétal, 277.
Petaloid, resembling petals.
Petiole, and *Pétiolate*, 148.
Phænogâmia, 21, 415.
Pilose, 200.
Pinna (wings), the segments of a pinnate leaf.
Pinnate, 209.
Pinnately trifoliate, 212.
Pinnatifid, 172.
Pistil, 267.
Pistillate, bearing pistils.
Pith, 119.
Placenta, 327.
Plaited (plicate), 354.
Plant defined, 5.
Plicate, folded like a fan.
Plumose, feathery, or feather-like.
Plumule, 7.
Pod, dry fruit ; as, capsule, legume, &c.
Pollen, 302.
Poly (in composition), signifies many, as,
Polyandrous, with many stamens.
Polyadélphous, stamens united into several sets.
Polygamous, having perfect flowers, with staminate or pistillate on the same plant.
Polypétalæ, 421.
Polypétalous, 277.
Polysépalous, 272.
Pome, 382.
Premorse, 43.
Prickles, sharp, stiff processes of the epidermis, 12.
Procumbent, trailing along the ground.
Process, any projection from the surface.
Prostrate, lying flat upon the ground.
Pubescent, 14, 198.
Pulp, the soft, juicy part of fruits.

Punctate, dotted as if with points.

Pyrriform, pear-shaped.

Pyxis, 381.

Quaternale, growing in fours.

Quinale, growing in fives.

Raceme, 241.

Racemose, resembling a raceme.

Rachis, 245.

Radiate, and *Radiant*, 255.

Radiate-veined, 167.

Radical, 98, 145.

Radicle, 7.

Ramial, of the branches, 146.

Ramose, branched, 36.

Ray, *Ray-flowers*, 254.

Receptacle, 253, 268.

Recurved, bent or curved backward.

Reflexed, curved back and downward.

Regular flower, 337.

Reniform, kidney-shaped, 171.

Repand, 191.

Reticulate, netted, 162.

Retuse, with a blunt notch in a blunt end.

Revolvute, rolled backward.

Rhizoma, 88.

Rhomboid, or *Rhombic*, oval, with angular sides.

Rib (costa), a ridge caused by raised veins.

Ringent, 285.

Root, 30, &c.

Root-stalk, see *Rhizoma* (88).

Rosaceous, 289.

Rostrate, with a beak.

Rotate, 284.

Rugose, 205.

Runcinate, 172.

Runner, 96.

Saccate, bag-like, or sack-like.

Sagittate, 171.

Samara (a key), 380.

Sap, 130. *Sap-wood*, 125.

Scabrous, rough, 16, 169.

Scape, 97, 242.

Scarious, dry, thin, scale-like.

Secund, all turned to one side.

Seed, 388, &c.

Segments, parts, or divisions.

Sépál, 271.

Septinate, 218.

Sericeous, silky.

Serôtinous, late in the season.

Serrate, and *Serrulate*, 183.

Sessile, 148, 240.

Selaceous, or *Selose*, bristly.

Sheath, the lower part of the leaf, or leaf-stalk, which surrounds the stem.

Shrub, 60.

Silicle, and *Silique*, 364, 365.

Simple, not compounded, of one piece.

Sinuate, 172.

Sinus, a rounded recess between the lobes of leaves, &c.

Spadix, and *Spathe*, 248.

Spatulate, 170.

Species, 24.

Spike, 244.

Spine, 109.

Spinéscent, or *Spinous*, 187.

Spongelets, 35.

Spores, 23.

Spur, 295.

Squarrose, of a ragged appearance; as, with crowded, spreading bracts, or leaves, &c.

Stamens, 266, 298.

Staminate, with stamens only, barren.

Stellate, 221.

Stem, 54, &c.

Sterile, barren, unfruitful, 264.

Stigma, 323.

Stings, sharp, poisonous hairs, 11.

Stipe, the stalk of a pod, &c.

Stipitate, borne on a stipe.

Stipule, 224.

Stipulate, 226.

- Stolon*, 108. *Stoloniferous*, bearing stolons.
Straight-veined, where the principal veins pass direct to the margin.
Striate, slightly furrowed with streaks.
Strigose, clothed with short, stiff, and close-pressed hairs.
Strobile, 387.
Style, 320.
Sub (in composition), 223.
Submersed, under water.
Subulate, awl-shaped.
Succulent, thick, juicy, fleshy.
Sucker, 107.
Superior, 273.
Supra-axillary, 239.
Suture, 362.
Symmetrical, 337.
Syngenesious, having the anthers united into a tube, 311: 19.
Systematic Botany, 400, &c.
Tendril, 100.
Terete, rounded, or cylindric.
Terminal, borne at the summit, 66.
Ternate, 211.
Testa, the outer seed-coat.
Tetradynamous, with 2 short and 4 long stamens, 310: 15.
Tetrاندrous, with 4 stamens, 308: 4.
Thallogens, 423.
Thallus, that part of the Lichen which bears the fruit.
Thorn, 109.
Throat, the orifice or tube of the corolla.
Thyrse, 257.
Tissues, *Vegetable*, 8.
Tomentose, 17, 204.
Toothed, dentate, 182.
Torus, the receptacle, 268.
Trailing, creeping or lying on the ground.
Tree, 59.
Triandrous, with 3 stamens, 308: 3.
Tricuspidate, having 3 points.
Tridentate, three-toothed.
Trifid, three-cleft.
Trifoliate, 3 leaves or leaflets growing together.
Tripinnate, 214.
Trilernate, 216.
Truncate, blunt, as if cut square off.
Trunk, 104.
Tube, 279.
Tuber, 87. *Tuberiferous*, tuber-bearing.
Tuberous, thickened like a tuber.
Tubular, hollow, like a tube, 286.
Tunicated, coated, 84.
Turbinate, shaped like a top.
Turgid, swollen.
Umbel, 250.
Umbellet, 251.
Umbillicate, depressed in the centre.
Unarmed, 109.
Uncinate, hooked at the end.
Under shrub, 61.
Undulate, wavy, 186.
Unguiculate, clawed, with a claw.
Unsymmetrical, 339, 340.
Urceolate, urn-shaped. Fig.
Utricle, 379.
Valvate, 347.
Valves, the parts which open, 367.
Variety, an unusual form of a species.
Veinlets, 159.
Veins, 158.
Veinulets, 160.
Velvety, clothed with thick, soft down.
Venation, 156.
Ventral suture, the front seam.
Ventricose, swelling out on one side.
Vernation, 352.
Verrucose, warty.
Verticil, 260.
Verticillate, 76, 143.
Vexillum, see Banner, 292.
Villous, or *Villose*, 202.

Vine, 99.

Virgate, wand-shaped, terete, and slender.

Wedge-shaped, see *Cuneate*.

Wheel-shaped, see *Rotate*.

Whorled, 76, 143.

Winged, as if furnished with wings.

Wings, 292.

Wood, 122.

Woody tissue, or *Fibre*, 123.

INDEX

OF THE NATURAL ORDERS AND GENERA.

The Natural Orders are in Capitals, the Genera in Roman, and the English names in Italic.

Abutilon, - - - -	134	Amphianthus, - - -	191	Arum, - - - - -	221
Acacia, - - - -	140	Amphicarpæa, - - -	140	ASCLEPIADACEÆ, -	214
Acer, - - - -	137	Amsonia, - - - -	213	Asclepias, - - -	215
ACERACEÆ, - - -	136	Amygdalus, - - -	146	Asparagus, - - -	234
Acerates, - - -	216	Anagallis, - - -	189	Asphodel, - - -	234
Achillea, - - -	180	Androcera, - - -	209	Asphodelus, - - -	234
Aconitum, - - -	104	Andromeda, - - -	185	Aster, - - - -	178
Acorus, - - - -	221	Androsace, - - -	189	Asteriscorts, - - -	169
Actæa, - - - -	103	Anemone, - - - -	164	Astilbe, - - - -	157
Actinomeris, - -	172	Anise, - - - -	160	Astragalus, - - -	139
Actinospermum, -	172	Anthemis, - - -	173	Atropa, - - - -	209
Adenarium, - - -	128	Antirrhinum, - - -	192	Auricula, - - - -	189
Adonis, - - - -	107	APETALÆ, - - - -	217	Avens, - - - -	149
Æschynomene, - -	140	Apios, - - - -	142	Aulicort, - - - -	116
Æthusa, - - - -	160	Apium, - - - -	160	Azalea, - - - -	185
Agave, - - - -	230	Aplectrum, - - -	225		
AGLUMACEÆ, - - -	221	APOCYNACEÆ, - - -	212	Baldwinia, - - -	172
Agrimonia, - - -	146	Apocynum, - - -	213	Ballota, - - - -	200
Alchemilla, - - -	146	Apogon, - - - -	173	Baptisia, - - - -	144
Alder, - - - -	220	Apple, - - - -	147	Barbarea, - - -	120
Alisma, - - - -	223	Apple-of-Peru, - - -	209	Bartonia, - - - -	211
ALISMACEÆ, - - -	222	Apricot, - - - -	146	Bean, - - - -	142
Alismads, - - -	222	Aquilegia, - - -	107	Bear-berry, - - -	185
Almond, - - - -	146	Arabis, - - - -	119	Beard-flower, - -	227
Alnus, - - - -	220	ARACEÆ, - - - -	221	Beard-longue, - -	192
Althea, - - - -	135	Archangelica, - - -	160	Beck-drops, - - -	186
Alyssum, - - - -	115	Archemora, - - -	159	Befaria, - - - -	186
Amaryllids, - - -	229	Arctostaphylos, - -	185	Belladonna, - - -	209
AMARYLLIDACEÆ, -	229	Arenaria, - - - -	128	Bell-flower, - - -	182
Amaryllis, - - -	230	Arethusa, - - - -	226	Bellis, - - - -	173
Amelanchier, - - -	147	Argemone, - - - -	113	Bellworts, - - -	181, 236
Amianthium, - - -	238	Armeniaca, - - -	146	BERBERIDACEÆ, -	109
American Centaury, -	212	Arnica, - - - -	172	Berberids, - - -	109
American Cowslip, -	190	Aroids, - - - -	221	Berberis, - - - -	110
Amorpha, - - - -	139	Arrow-Head, - - -	223	Berberry Bush, - -	110

Berlandiera, - - -	172	Calla, - - -	222	Chiogenes, - - -	185
Betula, - - -	220	Callistephus, - - -	173	Chrysogonum, - - -	172
BETULACEÆ, - - -	219	Calochortus, - - -	233	Chrysopsis, - - -	172
Bidens, - - -	177	Calonyction, - - -	208	Chrysosplenium, - - -	157
Bindweed, - - -	207, 208	Calopogon, - - -	228	Chimaphila, - - -	186
Birch, - - -	220	Caltha, - - -	103	Cicely, - - -	162
Birchwort, - - -	219	Calypso, - - -	226	Cichorium, - - -	174
Bitter Cress, - - -	119	Calystigia, - - -	208	Cimicifuga, - - -	103
Bitter-sweet, - - -	210	Camelina, - - -	116	Cinquefoil, - - -	149
Black-berry, - - -	148	Camomile, - - -	173	Circæa, - - -	153
Blephyllia, - - -	198	Campanula, - - -	182	Cladastus, - - -	139
Bletia, - - -	225	CAMPANULACEÆ, - - -	182	Clethra, - - -	186
Blood-root, - - -	114	Candytuft, - - -	117	Clematis, - - -	103
Blue-berries, - - -	185	Canterbury Bells, - - -	183	Clinopodium, - - -	200
Blue-curls, - - -	200	Capsella, - - -	117	Clitoria, - - -	140
Bluets, - - -	168	Capsicum, - - -	209	Civerns, - - -	167
Blue-eyed Grass, - - -	231	CAPRIFOLIACEÆ, - - -	164	Clover, - - -	143
Blue-hearts, - - -	192	Caraway, - - -	160	Cochlearia, - - -	116
Boltonia, - - -	173	Cardamine, - - -	119	Cockle, - - -	130
Boraginæ, - - -	203	Carnation, - - -	129	Coffee Bean, - - -	139
Borrageworts, - - -	202	Carpel-weed, - - -	128	Cohosh, - - -	103
BORRAGINACEÆ, - - -	202	Carrot, - - -	160	Collinsia, - - -	192
Borrago, - - -	203	Carum, - - -	160	Collinsonia, - - -	199
Borichia, - - -	173	CARYOPHYLLACEÆ, - - -	128	Columbo, - - -	211
Boxberry, - - -	185	Cassia, - - -	144	Colt's-foot, - - -	172
Brachyactæa, - - -	172	Castilleja, - - -	192	Columbine, - - -	107
Bramble, - - -	148	Catch-fly, - - -	130	Colutea, - - -	139
Brassica, - - -	116	Catnep, Catmint, - - -	201	Comarum, - - -	145, 146
Buchnera, - - -	192	Cedronella, - - -	200	Comfrey, - - -	203
Buck-bean, - - -	211	Celery, - - -	160	COMPOSITÆ, - - -	169
Buck-wheat, - - -	217, 218	Centaurry, - - -	211	Come-flower, - - -	172, 173
Bug-bane, - - -	103	Centrosema, - - -	140	Conium, - - -	162
Bugloss, - - -	203	Centunculus, - - -	189	Conioselinum, - - -	160
Bupleurum, - - -	160	Cephalanthus, - - -	167	Conobea, - - -	192
Burdock, - - -	170	Ceranthera, - - -	200	Convallaria, - - -	237
Burnet, - - -	146	Cerastium, - - -	128	CONVOLVULACEÆ, - - -	207
Burnet Saxifrage, - - -	146	Cerasus, - - -	147	Convolvulus, - - -	208
Burr-Marigold, - - -	177	Cercis, - - -	139	Coptis, - - -	107
Burr-seed, - - -	203	Chærophyllum, - - -	160	Coral-berry, - - -	165
Bush Clover, - - -	142	Chaff-seed, - - -	192	Corallorhiza, - - -	226
Bush Honeysuckle, - - -	166	Chamælium, - - -	238	Coral-root, - - -	226
Butter-cups, - - -	105	Chapmannia, - - -	139	Corn-flag, - - -	231
Button-bush, - - -	167	Chaptalia, - - -	173	Coriander, - - -	160
Cabbage, - - -	116	Chelidonium, - - -	113	Coriandrum, - - -	160
Cakile, - - -	116	Cheranthus, - - -	115	Coreopsis, - - -	177
Caladium, - - -	221	Chelone, - - -	194	CORNACEÆ, - - -	163
Calamintha, - - -	200	Cherry, - - -	147	Cornel, - - -	163, 164
Calendula, - - -	172	Chick Wintergreen, - - -	189	Cornus, - - -	164
Cation-bush, - - -	187	China Aster, - - -	173	Coronilla, - - -	139

Cosmanthus, - - -	205	Discopleura, - - -	159	Euphrasia, - - -	192
Cotton, - - -	135	Dittany, - - -	198	Evening Primrose, - - -	152-3
Cow Wheat, - - -	192	Dock, - - -	217	Eye-bright, - - -	192
Cranberry, - - -	186	Dodder, - - -	207	Faba, - - -	139
Cranichis, - - -	226	Dodecatheon, - - -	190	False Aloe, - - -	230
Cranzia, - - -	159	Dogbanes, - - -	212, 213	False Gentian, - - -	198
CRASSULACEÆ, - - -	156	Dog-tooth Violet, - - -	234	False Hellebore, - - -	238
Cratægus, - - -	146	Dogwood, - - -	154	False Indigo, - - -	140
Cress, - - -	116	Dolichos, - - -	140	False Gromwell, - - -	204
Crinum, - - -	230	Draba, - - -	118	False Mitrewort, - - -	169
Crocus, - - -	231	Dracocephalum, - - -	200	False Rocket, - - -	116
Crotalaria, - - -	139	Dragon-head, - - -	200	False Sneezwort, - - -	172
Crow-foot, - - -	101, 105	Dragon's-claw, - - -	226	False Sunflower, - - -	173
Crown-beard, - - -	173	Dragon-root, - - -	221	False Syringa, - - -	158
Crown Imperial, - - -	233	Dropwort, - - -	152	False Violet, - - -	151
CRUCIFERÆ, - - -	114	Drosera, - - -	124	False Wall-flower, - - -	120
Cryptotænia, - - -	162	DROSERACEÆ, - - -	124	False Wintergreen, - - -	187
Cunila, - - -	198	Dryas, - - -	146	Feniculum, - - -	160
Cuscuta, - - -	207	Dry Strawberry, - - -	151	Fennel, - - -	160
Curran, - - -	155	Dwarf-Pink, - - -	168	Fennel-flower, - - -	103
Cydonia, - - -	146	Dysodia, - - -	172	Fever-root, - - -	165
Cynoglossum, - - -	203	Echinodorus, - - -	223	Figworts, - - -	190
Cynthia, - - -	173	Echinosperrnum, - - -	203	Fleabane, - - -	179
Cypress-Vine, - - -	208	Echites, - - -	213	Floating-heart, - - -	211
Cypripedium, - - -	229	Echium, - - -	203	Flower-of-an-hour, - - -	134
Cyrilla, - - -	186	Eclipta, - - -	173	Flower-de-luce, - - -	231
Daffodil, - - -	230	Egg-plant, - - -	210	Forget-me-not, - - -	203
Dahlia, - - -	173	Elder, - - -	166	Foxglove, - - -	192
Daisy, - - -	173	Elecampane, - - -	172	Fragaria, - - -	148
Dalea, - - -	139	Elioth, - - -	186	Frasera, - - -	211
Dalibarda, - - -	151	Ellisia, - - -	205	Fritillaria, - - -	233
Dandelion, - - -	180	Enchanter's Nightshade, - - -	153	Fuchsia, - - -	153
Darlingtonia, - - -	140	Euslenia, - - -	215	Funkia, - - -	234
Datura, - - -	209	Epidendrum, - - -	226	Gallardia, - - -	172
Dasystoma, - - -	197	Epigæa, - - -	185	Galactia, - - -	140
Daucus, - - -	159	Epilobium, - - -	154	Galanthus, - - -	230
Day Lily, - - -	234	Erica, - - -	185	Galium, - - -	167
Decumaria, - - -	157	ERICACEÆ, - - -	184	Galliopsis, - - -	200
Delphinium, - - -	105	Erigenia, - - -	150	Garlic, - - -	235
Dentaria, - - -	119	Erigeron, - - -	179	Gaultheria, - - -	185
Desmodium, - - -	140	Erodium, - - -	132	Gaura, - - -	153
Diamorpha, - - -	156	Eryngium, - - -	159	Gem-fruit, - - -	158
Dianthus, - - -	129	Erysimum, - - -	120	Genista, - - -	139
Diervilla, - - -	166	Erythræa, - - -	211	Gentian, - - -	211
Digitalis, - - -	192	Erythrina, - - -	140	Gentian, - - -	211
Diodia, - - -	167	Erythronium, - - -	234	GENTIANACEÆ, - - -	210
Dionæa, - - -	124	Eschscholtzia, - - -	113	Gentianworts, - - -	210
Diplopappus, - - -	173	Eulophus, - - -	160		

Gerania, - - - -	131	<i>Hemp Nettle</i> , - - -	200	<i>Irish Moss</i> , - - -	156, 157
GERANIACEÆ, - - -	131	Hepatica, - - -	106	Isanthus, - - -	199
Geranium, - - -	132	Heracleum, - - -	159	Isopappus, - - -	172
Gerardia, - - -	197	Herpestis, - - -	192	Isopyrum, - - -	103
Geum, - - - -	149	Hesperis, - - -	115	Itea, - - - -	157
Gilia, - - - -	206	Heterotheca, - - -	172		
Gillenia, - - -	147	Henchera, - - -	157	Jeffersonia, - - -	109
Gladolus, - - -	231	Hibiscus, - - -	135	<i>Jerusalem Cherry</i> , - - -	210
Glaucium, - - -	113	Hieracium, - - -	180	<i>Jonquil</i> , - - -	230
Glaux, - - - -	189	Hippuris, - - -	152, 153	<i>Judas-tree</i> , - - -	139
Gleditschia, - - -	140	<i>Hollyhock</i> , - - -	135	JUNCAGINÆ, - - -	222
<i>Globe-flower</i> , - - -	103	<i>Honewort</i> , - - -	162	<i>June-berry</i> , - - -	147
Glottidium, - - -	139	<i>Honey Locust</i> , - - -	140	Jussiaea, - - -	154
Glycirriza, - - -	139	<i>Honeysuckle</i> , - - -	164, 165		
<i>Goat's Rue</i> , - - -	139	<i>Horehound</i> , - - -	200	Kalmia, - - - -	187
<i>Golden Alexanders</i> , - - -	163	<i>Horse Balm</i> , - - -	199	Kerria, - - - -	147
Goldenrod, - - -	174	<i>Horse Nettle</i> , - - -	210	<i>Knot-weed</i> , - - -	217
<i>Goldthread</i> , - - -	107	<i>Horse Radish</i> , - - -	116	Krigia, - - - -	173
Gonolobus, - - -	215	Hottonia, - - -	189		
Goodyera, - - -	226	<i>Hound-tongue</i> , - - -	203	LABIATÆ, - - -	198
Gooseberry, - - -	155	<i>House-leek</i> , - - -	156	<i>Labiata Plants</i> , - - -	198
<i>Grass Pink</i> , - - -	228	<i>Hyacinth</i> , - - -	233	<i>Labrador Tea</i> , - - -	186
Gratiola, - - -	193	Hyacinthus, - - -	233	Laburnum, - - -	138
<i>Gromwell</i> , - - -	205	Hydrangea, - - -	157	Lactuca, - - -	173, 174
GROSSULACEÆ, - - -	155	Hydrastis, - - -	103	<i>Ladies' Slipper</i> , - - -	229
<i>Ground-nut</i> , - - -	142	Hydrocotyle, - - -	159	<i>Ladies' Tresses</i> , - - -	229
Gymnocladus, - - -	140	HYDROPHYLLACEÆ, - - -	205	Lamium, - - - -	200
		<i>Hydrophylla</i> , - - -	205	Lampsana, - - -	173
Halenia, - - - -	211	Hydrophyllum, - - -	205	<i>Lark-spur</i> , - - -	105
<i>Hardhack</i> , - - -	151	Hyoscyamus, - - -	209	Lathyrus, - - -	139
<i>Hare-bell</i> , - - -	182	HYPERICACEÆ, - - -	126	Lavatera, - - -	134
<i>Hawk-weed</i> , - - -	180	Hypericum, - - -	126	Lavandula, - - -	199
<i>Heath-worts</i> , - - -	184, 185	Hypopitys, - - -	186	<i>Lavender</i> , - - -	199
Hedeoma, - - -	199	Hypoxis, - - -	230	Lavenworthia, - - -	116
<i>Hedge Hyssop</i> , - - -	193	Hypsis, - - -	199	Ledum, - - - -	186
<i>Hedge Mustard</i> , - - -	119	Hyssopus, - - -	200	LEGUMINOSÆ, - - -	137
<i>Hedge Nettle</i> , - - -	200			<i>Leguminous Plants</i> , - - -	137
Hedyotis, - - -	168	Iberis, - - - -	117	Lelophyllum, - - -	186
Hedysarum, - - -	140	Illicium, - - - -	108	Leontice, - - - -	109
Helenium, - - -	172	Ilysanthus, - - -	192	Leontodon, - - -	174
Helianthus, - - -	176	<i>Indian Pipes</i> , - - -	186	Leonurus, - - -	200
Helioopsis, - - -	173	<i>Indian Tobacco</i> , - - -	181	Lepachys, - - -	172
Heliotropium, - - -	203	<i>Indian Turnip</i> , - - -	221	Lepidium, - - -	117
Helleborus, - - -	103	Indigofera, - - -	139	Leptocaulis, - - -	160
<i>Hellebore</i> , - - -	103	Inula, - - - -	172	Leptopoda, - - -	172
Helonias, - - -	238	Iodanthus, - - -	116	Lepuropetalon, - - -	157
Helosciadium, - - -	159	IRIDACEÆ, - - - -	230	Lespedeza, - - -	142
Hemerocallis, - - -	234	<i>Iris</i> , - - - -	230	Leucanthemum, - - -	173
Hemianthus, - - -	192	<i>Iris</i> , - - - -	231	Leucasa, - - - -	200

Leucojum, - - -	230	Marigold, - - -	172	Monotropsis, - - -	186
Ligusticum, - - -	160	Marjorum, - - -	201	Motherwort, - - -	200
LILIACEÆ, - - -	233	Marrubium, - - -	200	Morning Glory, - - -	208
Lilium, - - -	235	Marsh Mallow, - - -	135	Mountain Laurel, - - -	187
Lily, - - -	235	Marsh Marigold, - - -	106	Mountain Mint, - - -	201
Lilyworts, - - -	233	Maruta, - - -	173	Mouse-ear, - - -	128
Lily-of-the-Valley, - - -	237	Matrimony-vine, - - -	209	Mouse-tail, - - -	103
Limnanthemum, - - -	211	Matthiola, - - -	115	Mud-flower, - - -	192
Limosella, - - -	192	May Apple, - - -	109	Mudwort, - - -	192
Linaria, - - -	194	May-flower, - - -	185	Mulgedium, - - -	174
Linnæa, - - -	165	May-weed, - - -	173	Mullein, - - -	193
Liparia, - - -	225	Meadow Rue, - - -	103	Mullein Pink, - - -	130
Liquorice, - - -	139	Meadow-sweet, - - -	151	Mustard, - - -	120
Liriodendron, - - -	109	Meconopsis, - - -	113	Mustardworts, - - -	114
Listera, - - -	225	Medeola, - - -	232	Mylocarium, - - -	186
Lithospermum, - - -	205	Medicago, - - -	140	Myosotis, - - -	203
Lobelia, - - -	181	Medick, - - -	140	Myosurus, - - -	103
LOBELIACEÆ, - - -	181	Melampyrum, - - -	192	Myriophyllum, - - -	153
Lobeliads, - - -	181	Melilotus, - - -	140		
Locust, - - -	141	MELANTHACEÆ, - - -	237	Narcissus, - - -	230
Lonicera, - - -	165	Melanthium, - - -	238	Nardosmia, - - -	173
Loose-strife, - - -	190	Melanthis, - - -	237	Nasturtium, - - -	116
Lophanthus, - - -	200	Mentha, - - -	200	Naumbergia, - - -	189
Lousewort, - - -	192	Melissa, - - -	200	NELUMBIACEÆ, - - -	110
Loveage, - - -	160	Menziesia, - - -	185	Nelumbo, - - -	110
Ludwigia, - - -	153	Mertensia, - - -	203	Nelumbium, - - -	110
Lunaria, - - -	117	Microstylis, - - -	225	Nepeta, - - -	201
Lungwort, - - -	203	Menyanthes, - - -	211	Nerium, - - -	213
Lupine, - - -	141	Milk Vetch, - - -	139	Neurophyllum, - - -	159
Lupinus, - - -	141	Milk-weed, - - -	215, 216	Nicandra, - - -	209
Lychnidea, - - -	206	Milkworts, - - -	120	Nicotiana, - - -	209
Lychnis, - - -	130	Milfoil, - - -	180	Nigella, - - -	103
Lycium, - - -	209	Mimulus, - - -	195	Nightshades, - - -	209
Lycopus, - - -	201	Mint, - - -	200	Ninebark, - - -	152
Lygodesmia, - - -	174	Mitchella, - - -	167	Noble Liverwort, - - -	105
Lysimachia, - - -	190	Mitella, - - -	168	Nolina, - - -	233
		Mitreola, - - -	169	NYPHÆACEÆ, - - -	111
Macbridea, - - -	200	Mitrewort, - - -	158	Nymphæa, - - -	111
Macranthera, - - -	193	Mock Orange, - - -	159		
Madwort, - - -	115	Modesty, - - -	160	Obolaria, - - -	211
Magnolia, - - -	108	Modiola, - - -	134	Ocymum, - - -	199
MAGNOLIACEÆ, - - -	108	Mollucella, - - -	200	Oenothera, - - -	153
Magnoliads, - - -	108	Mollugo, - - -	128	Oleander, - - -	213
Majorana, - - -	200	MONOPETALÆ, - - -	164	ONAGRACEÆ, - - -	152
Mallows, - - -	133	Monarda, - - -	201	Onion, - - -	235
Malope, - - -	134	Moneses, - - -	186	Onosmodium, - - -	204
Malva, - - -	134	Monkey-flower, - - -	195	ORCHIDACEÆ, - - -	225
MALVACEÆ, - - -	133	Monk's-hood, - - -	104	Orchids, - - -	225
Maples, - - -	136	Monotropa, - - -	186	Orchis, - - -	226

Origanum, - - -	200	Phlomis, - - -	200	Psoralea, - - -	140
Ornithogalum, - - -	233	Phlox, - - -	206	Pterospora, - - -	186
Orontium, - - -	221	<i>Phloxworts</i> , - - -	206	Pulmonaria, - - -	203
<i>Orpine</i> , - - -	156	Physalis, - - -	209	Pycnanthemum, - - -	200
Osmorhiza, - - -	162	Physostegia, - - -	200	Pyrola, - - -	187
Otophylla, - - -	193	Phytolacca, - - -	219	Pyrrhopappus, - - -	173
OXALIDACEÆ, - - -	132	PHYTOLACCACEÆ, - - -	219	Pyrus, <i>Pear</i> , - - -	147
Oxalis, - - -	133	<i>Pie-plant</i> , - - -	217		
Oxycoccus, - - -	186	<i>Pigweed</i> , - - -	170	Quamoclit, - - -	208
Oxyria, - - -	217	Pinckneya, - - -	167	<i>Queen-of-the-Prarie</i> , - - -	152
		<i>Pine-sap</i> , - - -	186	<i>Quince</i> , - - -	146
Pæonia, - - -	103	<i>Pink</i> , - - -	129		
<i>Painted-cup</i> , - - -	192	<i>Pinkworts</i> , - - -	128	<i>Radish</i> , - - -	116
Pancratium, - - -	230	<i>Piny</i> , - - -	103	RANUNCULACEÆ, - - -	101
PAPAVERACEÆ, - - -	113	Pitcheria, - - -	140	Ranunculus, - - -	105
Papaver, - - -	114	Pisum, - - -	141	Raphanus, - - -	116
<i>Pappoose-root</i> , - - -	109	Plectranthus, - - -	199	<i>Raspberry</i> , - - -	148
Pardanthus, - - -	231	Pleea, - - -	238	<i>Rattle-pod</i> , - - -	139
Paulownia, - - -	188	<i>Plum</i> , - - -	146	Rheum, - - -	217
Parsley, - - -	160	Podophyllum, - - -	109	<i>Rheumatism-root</i> , - - -	109
<i>Parsnip</i> , - - -	160	Podostigma, - - -	215	Rhinanthus, - - -	192
Parthenium, - - -	173	Pogonia, - - -	227	Rhododendron, - - -	186
<i>Partridge-berry</i> , - - -	167	<i>Poison Hemlock</i> , - - -	162	Rhodora, - - -	186
<i>Pasque-flower</i> , - - -	104	<i>Poke</i> , - - -	219, 238	Rhynchosia, - - -	140
Pastinaca, - - -	160	<i>Poke-weeds</i> , - - -	219	Ribes, - - -	155
<i>Pea</i> , - - -	141	Polemonium, - - -	206	Rivina, - - -	219
<i>Peach</i> , - - -	146	POLEMONIACEÆ, - - -	206	Robinia, - - -	141
Pedicularis, - - -	192	Polyanthus, - - -	230	<i>Rock Cress</i> , - - -	119
Pelargonium, - - -	132	Polygala, - - -	121	<i>Rocket</i> , - - -	115
Peltandra, - - -	221	POLYGALACEÆ, - - -	120	<i>Rosebay</i> , - - -	186
Pentalophus, - - -	203	POLYGONACEÆ, - - -	217	ROSACEÆ, - - -	145
Penthorum, - - -	156	Polygonum, - - -	217	<i>Rosa, Rose</i> , - - -	147
Pentstemon, - - -	192	Polymnia, - - -	172	<i>Rosemary</i> , - - -	200
<i>Pennywort</i> , - - -	211	POLYPETALE, - - -	101	Rosmarina, - - -	200
<i>Pepper</i> , - - -	209	Polypremum, - - -	192	RUBIACEÆ, - - -	167
<i>Pepper-grass</i> , - - -	117	Polytænia, - - -	160	Rubus, - - -	148
<i>Peppermint</i> , - - -	202	Pimpinella, - - -	160	Rudbeckia, - - -	172
<i>Pepper-root</i> , - - -	119	<i>Poplar</i> , - - -	109	Rumex, - - -	217
<i>Periwinkle</i> , - - -	213	<i>Poppy</i> , - - -	114		
Periploca, - - -	215	<i>Potato</i> , - - -	210	Sabbatia, - - -	212
Persica, - - -	146	Potentilla, - - -	149	<i>Sage</i> , - - -	199
Petalostemon, - - -	139	Poterium, - - -	146	<i>Sage Geranium</i> , - - -	199
Petroselinum, - - -	160	<i>Primrose</i> , - - -	189	Sagina, - - -	128
Petunia, - - -	209	Primula, - - -	189	Sagittaria, - - -	223
Phaca, - - -	139	PRIMULACEÆ, - - -	188	Salvia, - - -	199
Phacelia, - - -	205	<i>Primroseworts</i> , - - -	188	Sambucus, - - -	166
Phaseolus, - - -	142	Proserpinaca, - - -	153	Samolus, - - -	189
<i>Phaseolus-eye</i> , - - -	107	Prunella, - - -	200	Sanguinaria, - - -	114
Philadelphus, - - -	158	Prunus, - - -	146	Sanguisorba, - - -	146

<i>Santale</i> , - - - -	161	<i>Snow-flake</i> , - - -	230	<i>Thornbush</i> , - - -	146
<i>Sanicula</i> , - - -	161	SOLANACEÆ , - - -	209	<i>Thyme</i> , - - - -	200
<i>Saponaria</i> , - - -	128	<i>Solanum</i> , - - -	210	<i>Thymus</i> , - - -	200
<i>Sarracenia</i> , - - -	112	<i>Solidago</i> , - - -	174	<i>Tiarella</i> , - - -	158
SARRACENIACEÆ , - - -	112	<i>Solomon's Seal</i> , 234, 237		<i>Tickseed</i> , - - -	177
<i>Satin-flower</i> , - - -	117	<i>Sonchus</i> , - - -	173	<i>Tiedmannia</i> , - - -	159
<i>Satureja</i> , - - -	200	<i>Sorrel</i> , - - -	217	<i>Tiger-flower</i> , - - -	231
<i>Saxifraga</i> , - - -	157	<i>Specularia</i> , - - -	182	<i>Tigridia</i> , - - -	231
<i>Saxifrage</i> , - - -	157	<i>Speedwell</i> , - - -	194	<i>Tillæa</i> , - - -	156
SAXIFRAGACEÆ , - - -	157	<i>Spermaceæ</i> , - - -	167	<i>Tipularia</i> , - - -	225
<i>Scheuchzeria</i> , - - -	222	<i>Spigelia</i> , - - -	167	<i>Toad-flax</i> , - - -	192
<i>Schizanthus</i> , - - -	191	<i>Spirea</i> , - - -	151	<i>Tobacco</i> , - - -	209
<i>Schœnocaulon</i> , - - -	238	<i>Spiranthes</i> , - - -	229	<i>Tofieldia</i> , - - -	238
<i>Schrankia</i> , - - -	140	<i>Stachys</i> , - - -	200	<i>Tomato</i> , - - -	210
<i>Schwalbea</i> , - - -	192	<i>Star-grass</i> , - - -	230	<i>Tooth-root</i> , - - -	119
<i>Scilla</i> , - - - -	233	<i>Star-of-Bethlehem</i> , - - -	233	<i>Tragopogon</i> , - - -	174
<i>Scorpion-grass</i> , - - -	203	<i>Starwort</i> , - - -	178	<i>Trautvetteria</i> , - - -	103
<i>Scotch-Broom</i> , - - -	139	<i>Stellaria</i> , - - -	128	<i>Trientalis</i> , - - -	189
<i>Screw-Stem</i> , - - -	211	<i>Stock</i> , - - -	115	<i>Trefoil</i> , - - -	143
SCROPHULARIACEÆ , - - -	191	<i>St. John's-wort</i> , - - -	126	<i>Triglochin</i> , - - -	222
<i>Scul-cap</i> , - - -	202	<i>Stonecrop</i> , - - -	156	TRILLIACEÆ , - - -	232
<i>Scutellaria</i> , - - -	202	<i>St. Peter's-wort</i> , - - -	152	<i>Trillials</i> , - - -	232
<i>Sea Rocket</i> , - - -	116	<i>Stramonium</i> , - - -	209	<i>Trillium</i> , - - -	232
<i>Sedum</i> , - - - -	156	<i>Strawberry</i> , - - -	148	<i>Triosteum</i> , - - -	165
<i>Semi-flower</i> , - - -	192	<i>Streptopus</i> , - - -	234	<i>Troximon</i> , - - -	173
<i>Sempervivum</i> , - - -	156	<i>Stylosanthes</i> , - - -	140	<i>Trichostemma</i> , - - -	200
<i>Senebiera</i> , - - -	118	<i>Subularia</i> , - - -	116	<i>Tuberose</i> , - - -	233
<i>Senecio</i> , - - -	172	<i>Sullivantia</i> , - - -	157	<i>Tulip</i> , - - - -	233
<i>Sericocarpus</i> , - - -	173	<i>Summer-Savory</i> , - - -	200	<i>Tulipa</i> , - - -	233
<i>Sebania</i> , - - -	139	<i>Sundews</i> , - - -	124	<i>Tulip Tree</i> , - - -	109
<i>Sentera</i> , - - -	215	<i>Sunflower</i> , - - -	176	<i>Turnsol</i> , - - -	203
<i>Seymeria</i> , - - -	193	<i>Swamp Pink</i> , - - -	186	<i>Turritis</i> , - - -	116
<i>Shell-flower</i> , - - -	200	<i>Sweet Basil</i> , - - -	189	<i>Tussilago</i> , - - -	172
<i>Shepherd's-Purse</i> , - - -	117	<i>Sweet-Flag</i> , - - -	221	<i>Twin-flower</i> , - - -	165
<i>Sibbaldia</i> , - - -	147	<i>Symphytum</i> , - - -	203	<i>Twin-leaf</i> , - - -	109
<i>Sickle-pod</i> , - - -	119	<i>Symplocarpus</i> , - - -	221	<i>Twist-foot</i> , - - -	234
<i>Sida</i> , - - - -	134	<i>Symphoricarpus</i> , - - -	165	UMBELLIFERÆ , - - -	159
<i>Silene</i> , - - - -	130	<i>Synandra</i> , - - -	200	<i>Umbelworts</i> , - - -	159
<i>Silk-grass</i> , - - -	215	<i>Synthiria</i> , - - -	191	<i>Uvularia</i> , - - -	236
<i>Silphium</i> , - - -	172	<i>Tagetes</i> , - - - -	172	<i>Vaccinium</i> , - - -	185
<i>Sinapis</i> , - - -	120	<i>Tall Hyssop</i> , - - -	200	<i>Vachellia</i> , - - -	140
<i>Sisyrinchium</i> , - - -	231	<i>Tall Pink</i> , - - -	192	<i>Venus' Fly-trap</i> , - - -	124
<i>Sium</i> , - - - -	159	<i>Taraxacum</i> , - - -	180	<i>Veratrum</i> , - - -	238
<i>Smilacina</i> , - - -	237	<i>Tephrosia</i> , - - -	139	<i>Verbascum</i> , - - -	193
<i>Snake-head</i> , - - -	195	<i>Tetragonotheca</i> , - - -	172	<i>Verbesina</i> , - - -	172
<i>Snap-dragon</i> , - - -	192	<i>Teucrium</i> , - - -	200	<i>Veronica</i> , - - -	194
<i>Sneezwort</i> , - - -	172	<i>Thalictrum</i> , - - -	103	<i>Vesicaria</i> , - - -	116
<i>Snow-berry</i> , - - -	165	<i>Thaspium</i> , - - -	163		
<i>Snow-drop</i> , - - -	230				

Viburnum, - - -	165	Water-leaf, - - -	205	Xerophyllum, - - -	238
Vicia, - - -	139	Water Lily, - - -	111	Yarrow, - - -	180
Vinca, - - -	213	Water Pitchers, - - -	112	Yellow Day-lily, - - -	234
Viola, - - -	122	Water Plantain, - - -	223	Yellow Gerardia, - - -	197
VIOLACEAE, - - -	122	White-weed, - - -	179	Yellow Rattle, - - -	192
Violets, - - -	122	White-wood, - - -	109	Yellow-root, - - -	103
Vetch, - - -	139	Willow-grass, - - -	118	Yucca, - - -	234
		Wild Indigo, - - -	144		
Wake-Robin, - - -	232	Wild Senna, - - -	144	Zanthorhiza, - - -	103
Waldsteinia, - - -	151	Willow-herb, - - -	154	Zigadenus, - - -	238
Wall-flower, - - -	115	Winter Cress, - - -	120	Zinnia, - - -	173
Warea, - - -	116	Wistaria, - - -	139	Zizia, - - -	163
Water-carpet, - - -	157	Wolf-berry, - - -	165	Zornia, - - -	139
Water Hemlock, - - -	162	Wood-sorrel, - - -	132		
Water Horehound, - - -	201				

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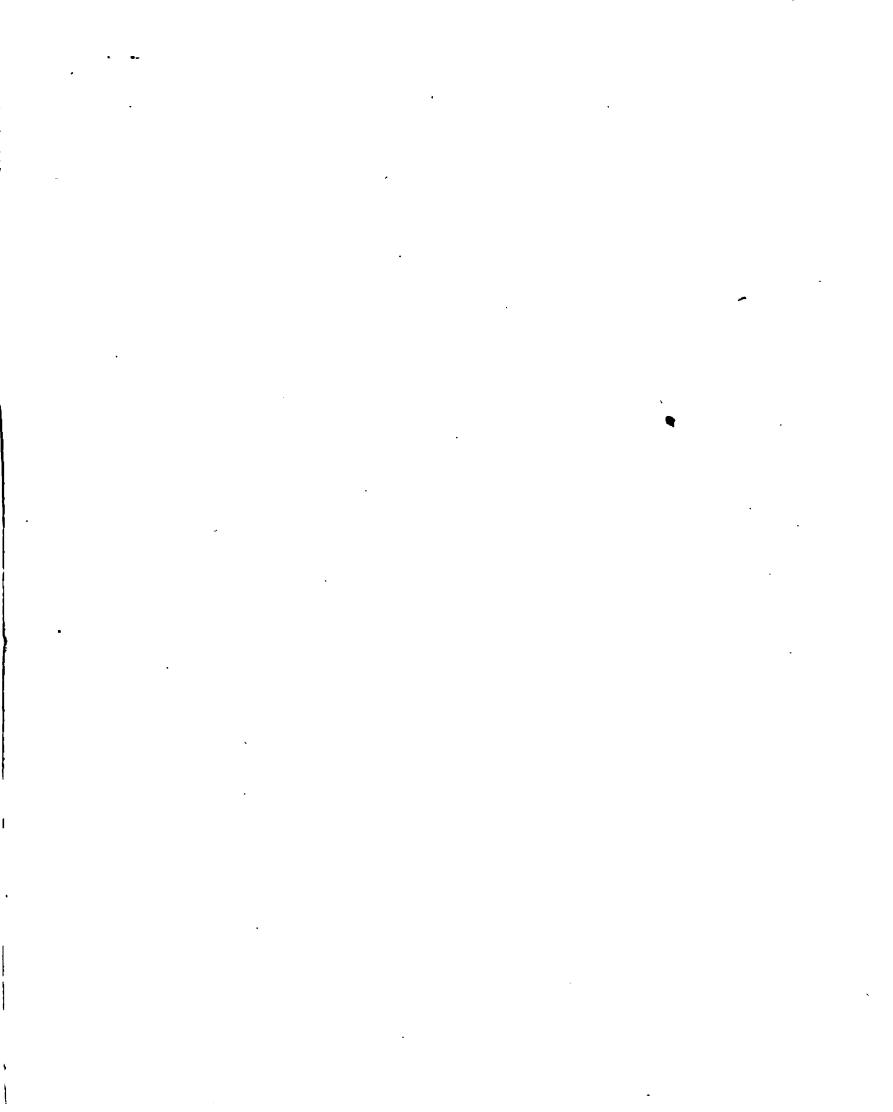
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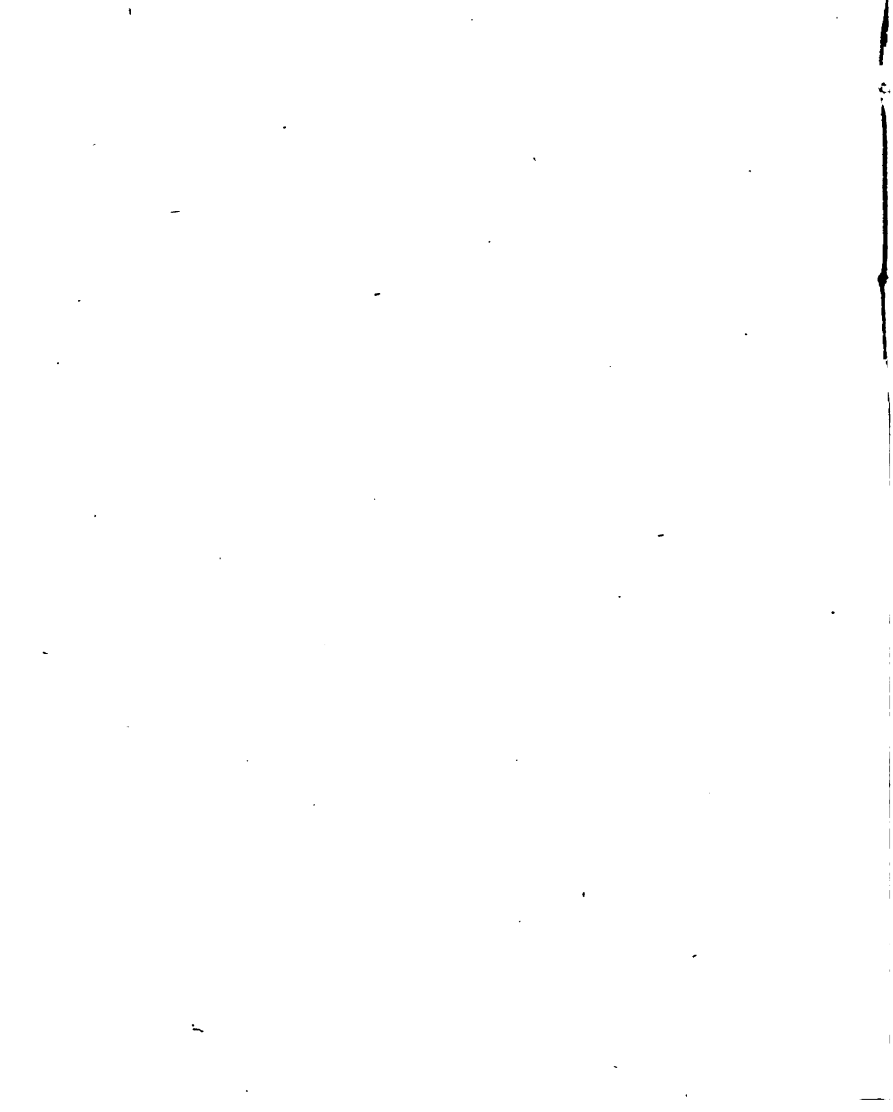
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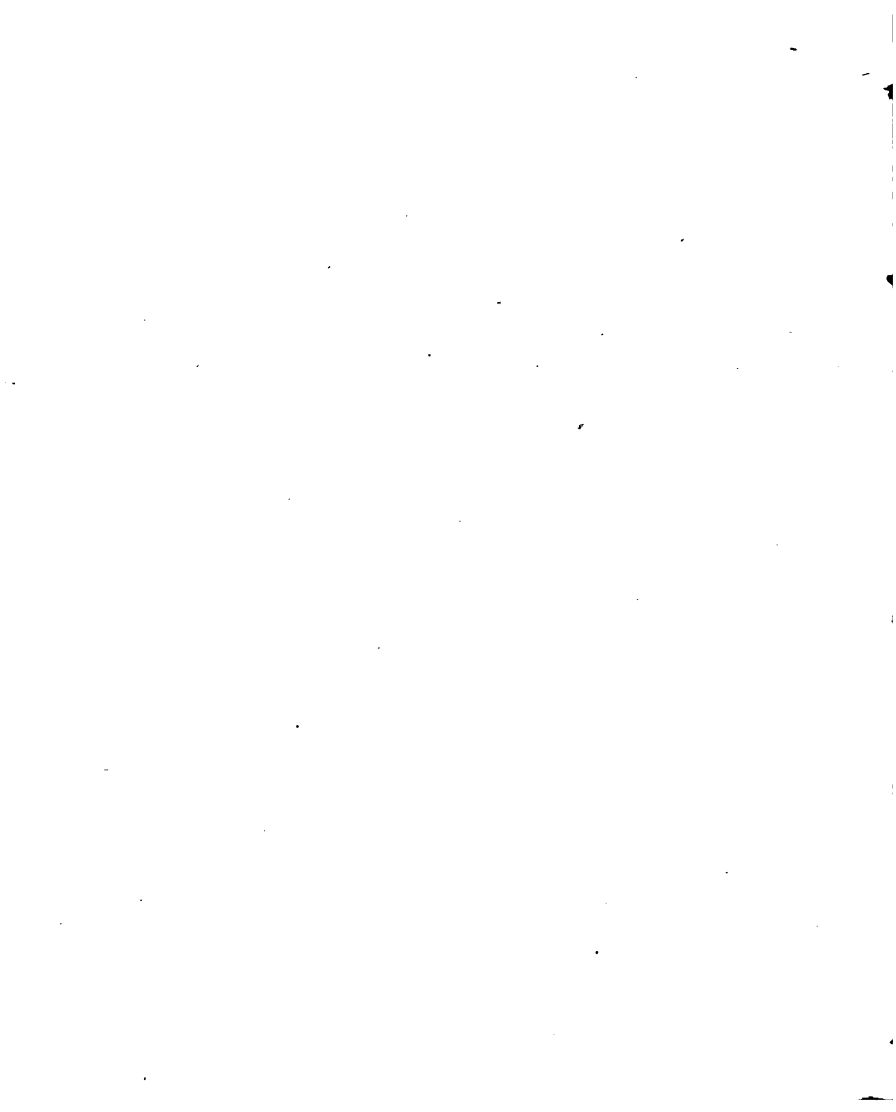
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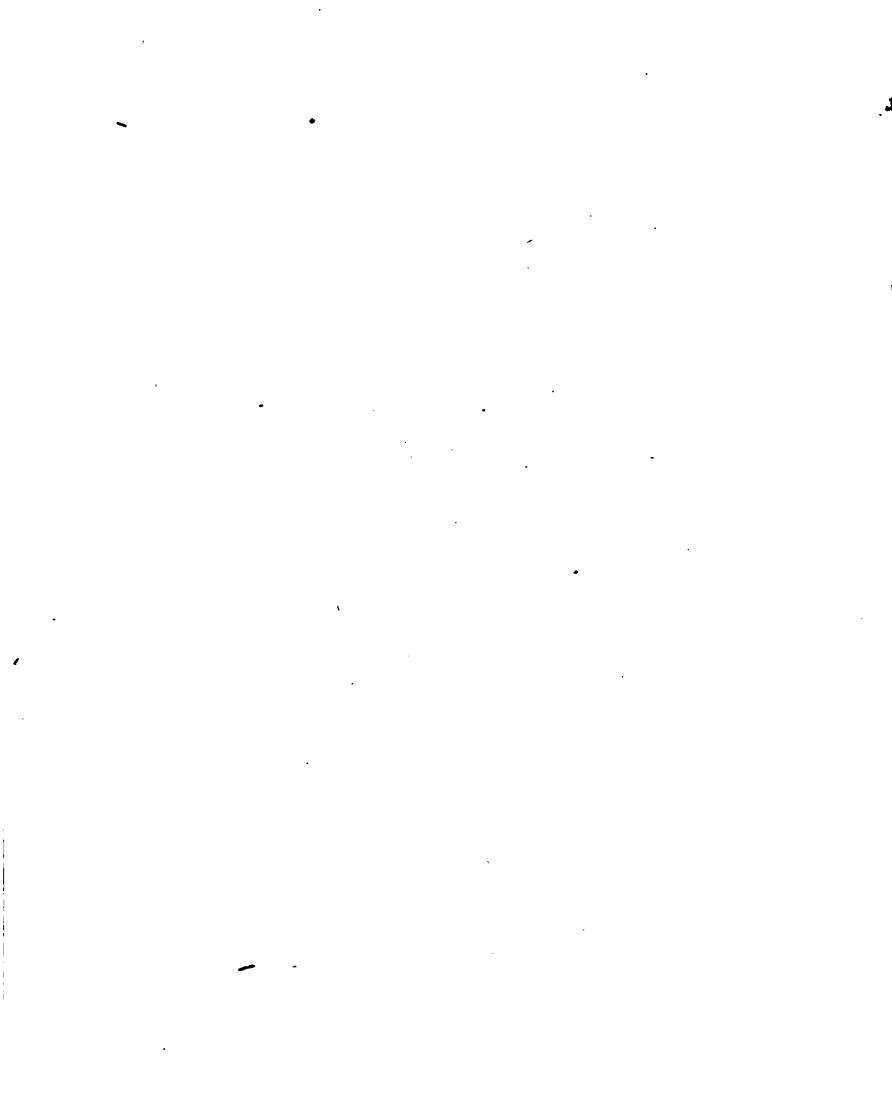


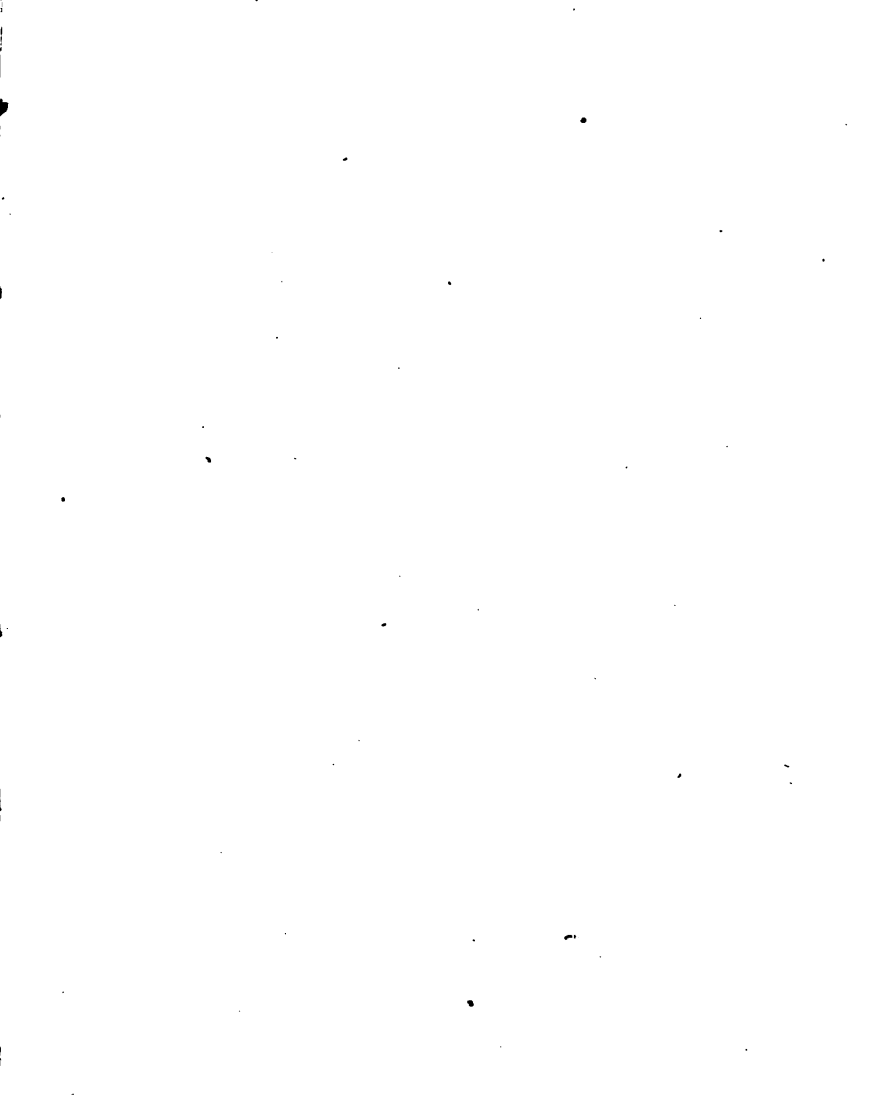




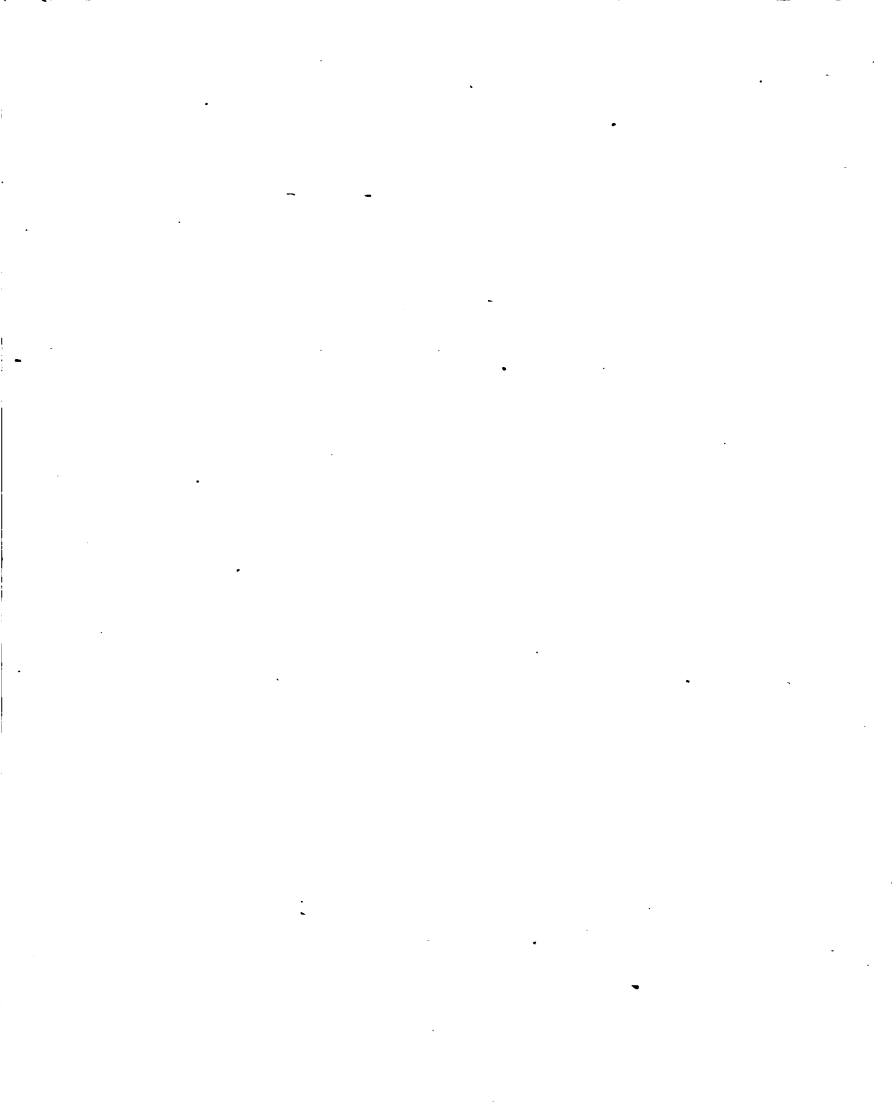


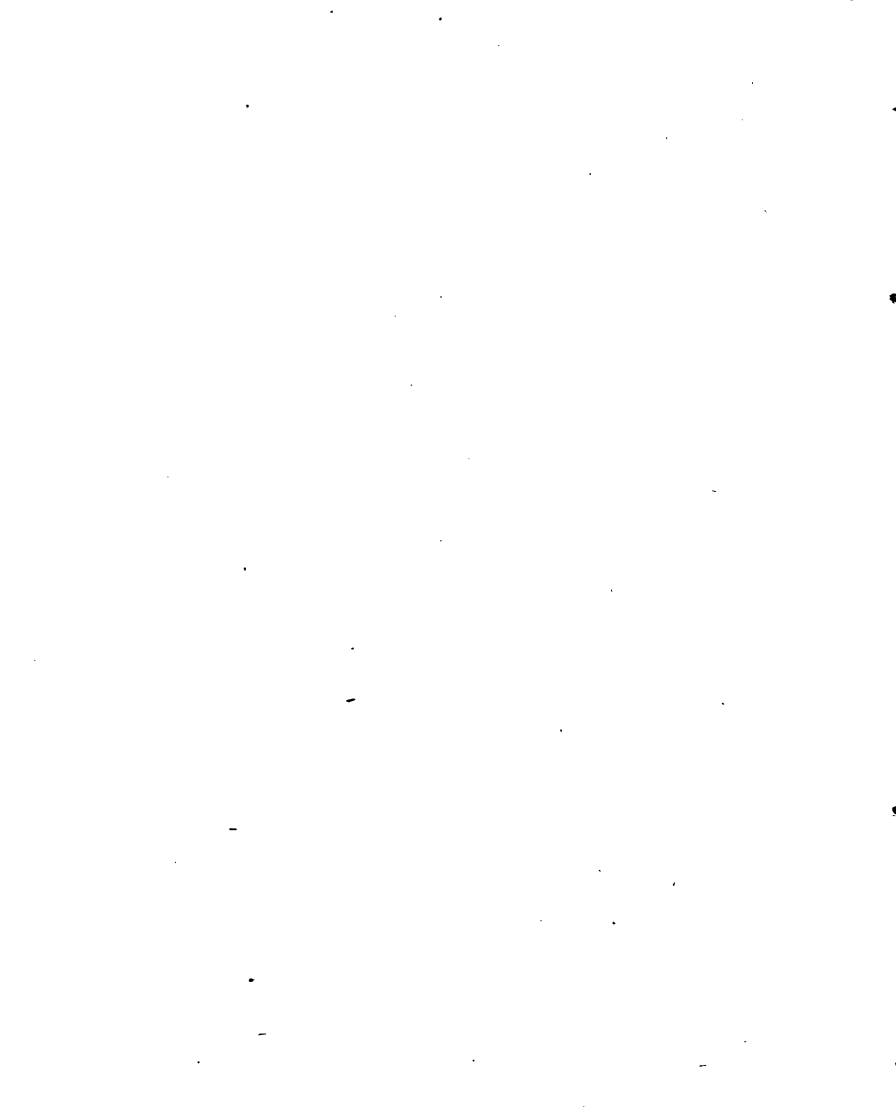


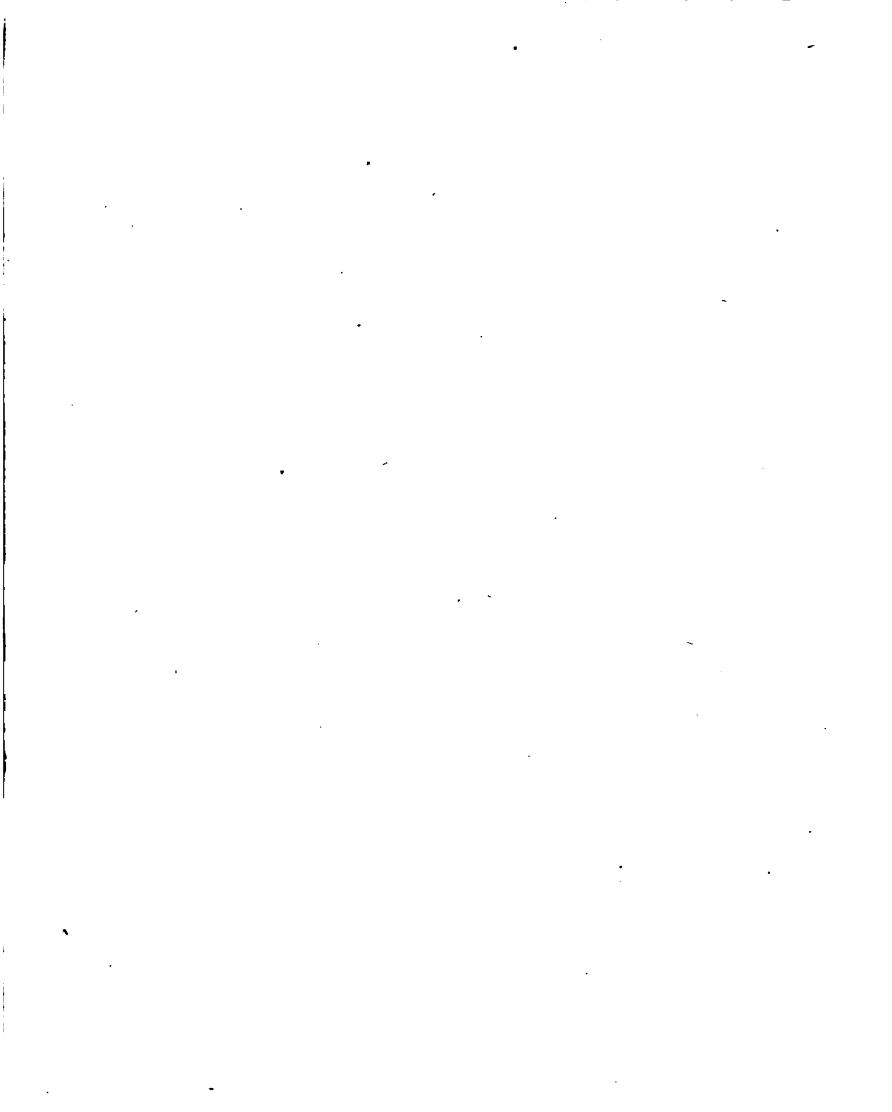












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